GE Healthcare

Precision™ 180 DICOM Conformance Statement

DOC2158897 Rev 5

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1 PURPOSE AND SCOPE

This document describes the conformance of Digitec INSIDE_SW application to DICOM standard as regarding DICOM communication to save acquired images and associated Dose SR to a network storage device or CD-R, print to a networked hardcopy device and inform the information system about the work actually done.

Table 1-1 shows network related services:

TABLE 1-1
NETWORK SERVICES

SOP CLASSES	USER OF SERVICE (SCU)	PROVIDER OF SERVICE (SCP)
Transfer		
Computed Radiology Image Storage	Yes	No
Digital X-Ray Image Storage for Presentation	Yes	No
X-Ray Angiographic Image Storage	Yes	No
X-Ray Radiofluoroscopic Image Storage	Yes	No
Workflow Management		
Modality Worklist	Option	No
Storage Commitment Push Model	Option	No
Modality Performed Procedure Step	Option	No
Query/Retrieve		
Patient Root Q/R - FIND	Option	No
Patient Root Q/R – MOVE	Option	No
Study Root Q/R - FIND	Option	No
Study Root Q/R - MOVE	Option	No
Print Management		
Basic Grayscale Print Management	Option	No
Notes, Reports, Measurements Transfer		
X-Ray Radiation Dose SR	Option	No

The SOP Classes are categorized as follows:

TABLE 1-2
UID VALUES

UID VALUE	UID NAME	CATEGORY
1.2.840.10008.5.1.4.1.1.1	Computed Radiology Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.1.1	Digital X-Ray Image Storage for Presentation	Transfer
1.2.840.10008.5.1.4.1.1.12.1	X-Ray Angiographic Image Storage	Transfer
1.2.840.10008.5.1.4.1.1.12.2	X-Ray Radiofluoroscopic Image Storage	Transfer
1.2.840.10008.5.1.4.31	Modality Worklist	Workflow Management
1.2.840.10008.1.20.1	Storage Commitment Push Model	Workflow Management
1.2.840.10008.3.1.2.3.3	Modality Performed Procedure Step	Workflow Management

1.2.840.10008.5.1.4.1.2.1.1	Patient Root Q/R - FIND	Query/Retrieve
1.2.840.10008.5.1.4.1.2.1.2	Patient Root Q/R – MOVE	Query/Retrieve
1.2.840.10008.5.1.4.1.2.2.1	Study Root Q/R - FIND	Query/Retrieve
1.2.840.10008.5.1.4.1.2.2.2	Study Root Q/R - MOVE	Query/Retrieve
1.2.840.10008.5.1.1.9	Basic Grayscale Print Management	Print Management
1.2.840.10008.5.1.4.1.1.88.67	X-Ray Radiation Dose SR	Report Transfer

Table 1-3 shows Supported Media Storage Application Profiles (with roles):

TABLE 1-3
MEDIA SERVICES

MEDIA STORAGE APPLICATION PROFILE	WRITE FILES (FSC OR FSU)	READ FILES (FSR)
Compact Disk - Recordable		
Augmented General Purpose CD-R	FSC: Option FSU: No	No
DVD		
General Purpose DVD-RAM	FSC: Option FSU: No	No

2 TERMINOLOGY AND ABBREVIATION

ABBREVIATION/ACRONYM	MEANING
AE	Application Entity
AET	Application Entity Title
CD-R	Compact Disk Recordable
DICOM	Digital Imaging and Communications in Medicine
FSC	File-Set Creator
FSU	File-Set Updater
FSR	File-Set Reader
IHE	Integrating the Healthcare Enterprise
IOD	Information Object Definition
IPv4	Internet Protocol version 4
IPv6	Internet Protocol version 6
ISO	International Organization for Standards
MPPS	Modality Performed Procedure Step
MSPS	Modality Scheduled Procedure Step
MWL	Modality Worklist

PDU	Protocol Data Unit
SCP	Service Class Provider
SCU	Service Class User
SOP	Service-Object Pair
SPS	Scheduled Procedure Step
SR	Structured Reporting
TCP/IP	Transmission Control Protocol/Internet Protocol
VR	Value Representation

In the document tables a number of abbreviations are used in specific columns.

The abbreviations used in the "Presence of Module/Presence of Value/Presence of Item" column are:

ABBREVIATION/ACRONYM	MEANING
VNAP	Value Not Always Present (sent without value field if no value is present)
ANAP	Attribute/Item Not Always Present
MNAP	Module Not Always Present
ALWAYS	Always Present with a valid value
EMPTY	Attribute is always present but without value field (empty)

The abbreviations used in the "Source" column are:

ABBREVIATION/ACRONYM	MEANING
MWL	the attribute/item value source is Modality Worklist
USER	the attribute/item value source is from User input
AUTO	the attribute/item value is generated automatically
MPPS	the attribute/item value is the same as that used for MPPS
CONFIG	the attribute/item value source is a configurable parameter
FIX	the attribute/item value is fixed

3 REFERENCES

REF.	DOCUMENT TITLE

[1]	NEMA free published DICOM Standard: NEMA PS3 Digital Imaging and Communications in Medicine (DICOM) Standard, available free at http://medical.nema.org/

4 INTRODUCTION

4.1 AUDIENCE

This document is written for the people that need to understand how INSIDE_SW will integrate into their healthcare facility. This includes both those responsible for overall imaging network policy and architecture, as well as integrators who need to have a detailed understanding of the DICOM features of the product. This document contains some basic DICOM definitions so that any reader may understand how this product implements DICOM features. However, integrators are expected to fully understand all the DICOM terminology, how the tables in this document relate to the product's functionality, and how that functionality integrates with other devices that support compatible DICOM features.

4.2 REMARKS

The scope of this DICOM Conformance Statement is to facilitate integration between INSIDE_SW and other DICOM products. The Conformance Statement should be read and understood in conjunction with the DICOM Standard. DICOM by itself does not guarantee interoperability. The Conformance Statement does, however, facilitate a first-level comparison for interoperability between different applications supporting compatible DICOM functionality.

This Conformance Statement is not supposed to replace validation with other DICOM equipment to ensure proper exchange of intended information. In fact, the user should be aware of the following important issues:

— The comparison of different Conformance Statements is just the first step towards assessing interconnectivity and interoperability between the product and other DICOM conformant equipment.

— Test procedures should be defined and executed to validate the required level of interoperability with specific compatible DICOM equipment, as established by the healthcare facility.

INSIDE_SW conforms to the standards defined by Integrating the Healthcare Enterprise (IHE). The IHE Integration Statement for INSIDE_SW, together with the IHE Technical Framework, may facilitate the process of validation testing.

4.3 TERMS AND DEFINITIONS

Informal definitions are provided for the following terms used in this Conformance Statement. The DICOM Standard is the authoritative source for formal definitions of these terms.

Abstract Syntax – the information agreed to be exchanged between applications, generally equivalent to a Service/Object Pair (SOP) Class. Examples : Verification SOP Class, Modality Worklist Information Model Find SOP Class, Computed Radiography Image Storage SOP Class.

Application Entity (AE) – an end point of a DICOM information exchange, including the DICOM network or media interface software; i.e., the software that sends or receives DICOM information objects or messages. A single device may have multiple Application Entities.

Application Entity Title – the externally known name of an *Application Entity*, used to identify a DICOM application to other DICOM applications on the network.

Application Context – the specification of the type of communication used between *Application Entities*. Example: DICOM network protocol.

Association – a network communication channel set up between *Application Entities*.

Attribute – a unit of information in an object definition; a data element identified by a *tag*. The information may be a complex data structure (Sequence), itself composed of lower level data elements. Examples: Patient ID (0010,0020), Accession Number (0008,0050), Photometric Interpretation (0028,0004), Procedure Code Sequence (0008,1032).

Information Object Definition (IOD) – the specified set of *Attributes* that comprise a type of data object; does not represent a specific instance of the data object, but rather a class of similar data objects that have the same properties. The *Attributes* may be specified as Mandatory (Type 1), Required but possibly unknown (Type 2), or Optional (Type 3), and there may be conditions associated with the use of an Attribute (Types 1C and 2C). Examples: MR Image IOD, CT Image IOD, Print Job IOD.

Media Application Profile – the specification of DICOM information objects and encoding exchanged on removable media (e.g., CDs)

Module – a set of *Attributes* within an *Information Object Definition* that are logically related to each other. Example: Patient Module includes Patient Name, Patient ID, Patient Birth Date, and Patient Sex.

Negotiation – first phase of *Association* establishment that allows *Application Entities* to agree on the types of data to be exchanged and how that data will be encoded.

Presentation Context – the set of DICOM network services used over an *Association*, as negotiated between *Application Entities*; includes *Abstract Syntaxes* and *Transfer Syntaxes*.

Protocol Data Unit (PDU) – a packet (piece) of a DICOM message sent across the network. Devices must specify the maximum size packet they can receive for DICOM messages.

Security Profile – a set of mechanisms, such as encryption, user authentication, or digital signatures, used by an *Application Entity* to ensure confidentiality, integrity, and/or availability of exchanged DICOM data

Service Class Provider (SCP) – role of an *Application Entity* that provides a DICOM network service; typically, a server that performs operations requested by another *Application Entity* (*Service Class User*). Examples: Picture Archiving and Communication System (image storage SCP, and image query/retrieve SCP), Radiology Information System (modality worklist SCP).

Service Class User (SCU) – role of an *Application Entity* that uses a DICOM network service; typically, a client. Examples: imaging modality (image storage SCU, and modality worklist SCU), imaging workstation (image query/retrieve SCU)

Service/Object Pair (SOP) Class – the specification of the network or media transfer (service) of a particular type of data (object); the fundamental unit of DICOM interoperability specification. Examples: Ultrasound Image Storage Service, Basic Grayscale Print Management.

Service/Object Pair (SOP) Instance – an information object; a specific occurrence of information exchanged in a *SOP Class*. Examples: a specific x-ray image.

Tag – a 32-bit identifier for a data element, represented as a pair of four digit hexadecimal numbers, the "group" and the "element". If the "group" number is odd, the tag is for a private (manufacturer-specific) data element. Examples: (0010,0020) [Patient ID], (07FE,0010) [Pixel Data], (0019,0210) [private data element]

Transfer Syntax – the encoding used for exchange of DICOM information objects and messages. Examples: *JPEG* compressed (images), little endian explicit value representation.

Unique Identifier (UID) – a globally unique "dotted decimal" string that identifies a specific object or a class of objects; an ISO-8824 Object Identifier. Examples: Study Instance UID, SOP Class UID, SOP Instance UID.

Value Representation (VR) – the format type of an individual DICOM data element, such as text, an integer, a person's name, or a code. DICOM information objects can be transmitted with either explicit identification of the type of each data element (Explicit VR), or without explicit identification (Implicit VR); with Implicit VR, the receiving application must use a DICOM data dictionary to look up the format of each data element.

4.4 BASICS OF DICOM COMMUNICATION

This section describes terminology used in this Conformance Statement for the non-specialist. The key terms used in the Conformance Statement are highlighted in *italics* below. This section is not a substitute for training about DICOM, and it makes many simplifications about the meanings of DICOM terms.

Two *Application Entities* (devices) that want to communicate with each other over a network using DICOM protocol must first agree on several things during an initial network "handshake". One of the two devices must initiate an *Association* (a connection to the other device), and ask if specific services, information, and encoding can be supported by the other device (*Negotiation*).

DICOM specifies a number of network services and types of information objects, each of which is called an *Abstract Syntax* for the Negotiation. DICOM also specifies a variety of methods for encoding data, denoted *Transfer Syntaxes*. The Negotiation allows the initiating Application Entity to propose combinations of Abstract Syntax and Transfer Syntax to be used on the Association; these combinations are called *Presentation Contexts.* The receiving Application Entity accepts the Presentation Contexts it supports.

For each Presentation Context, the Association Negotiation also allows the devices to agree on *Roles* – which one is the *Service Class User* (SCU - client) and which is the *Service Class Provider* (SCP - server). Normally the device initiating the connection is the SCU, i.e., the client system calls the server, but not always.

The Association Negotiation finally enables exchange of maximum network packet (*PDU*) size, security information, and network service options (called *Extended Negotiation* information).

The Application Entities, having negotiated the Association parameters, may now commence exchanging data. Common data exchanges include queries for worklists and lists of stored images, transfer of image objects and analyses (structured reports), and sending images to film printers. Each exchangeable unit of data is formatted by the sender in accordance with the appropriate *Information Object Definition*, and sent using the negotiated Transfer Syntax. There is a Default Transfer Syntax that all systems must accept, but it may not be the most efficient for some use cases. Each transfer is explicitly acknowledged by the receiver with a *Response Status* indicating success, failure, or that query or retrieve operations are still in process.

Two Application Entities may also communicate with each other by exchanging media (such as a CD-R). Since there is no Association Negotiation possible, they both use a *Media Application Profile* that specifies “pre-negotiated” exchange media format, Abstract Syntax, and Transfer Syntax.

5 NETWORKING

5.1 IMPLEMENTATION MODEL

5.1.1 APPLICATION DATA FLOW

Figure 5.1-1 is the Data Flow Diagram representing all the Application Entities present in the implementation. The Diagram graphically depicts the relationship of the AE's use of DICOM to Real-World Activities as well as any applicable user interaction.

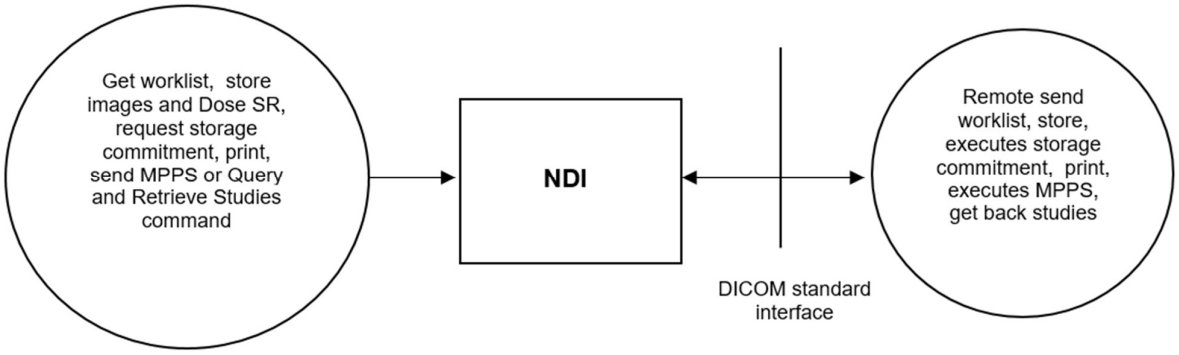

Get worklist, store images and Dose SR, request storage commitment, print, send MPPS or Query and Retrieve Studies command
NDI
DICOM standard interface
Remote send worklist, store, executes storage commitment, print, executes MPPS, get back studies

FIGURE 5.1-1
APPLICATION DATA FLOW DIAGRAM

5.1.2 FUNCTIONAL DEFINITION OF AE'S

5.1.2.1 Functional Definition of NDI AE

INSIDE_SW *Network Dicom Interface* (NDI) is activated in any step of the workflow of the modality. Operator starts daily activity by getting the worklist from HIS/RIS, admitting scheduled patient and acquiring requested X-Ray images.

During each phase of the activity, specific DICOM services are activated to communicate to DICOM peer servers as described in the following.

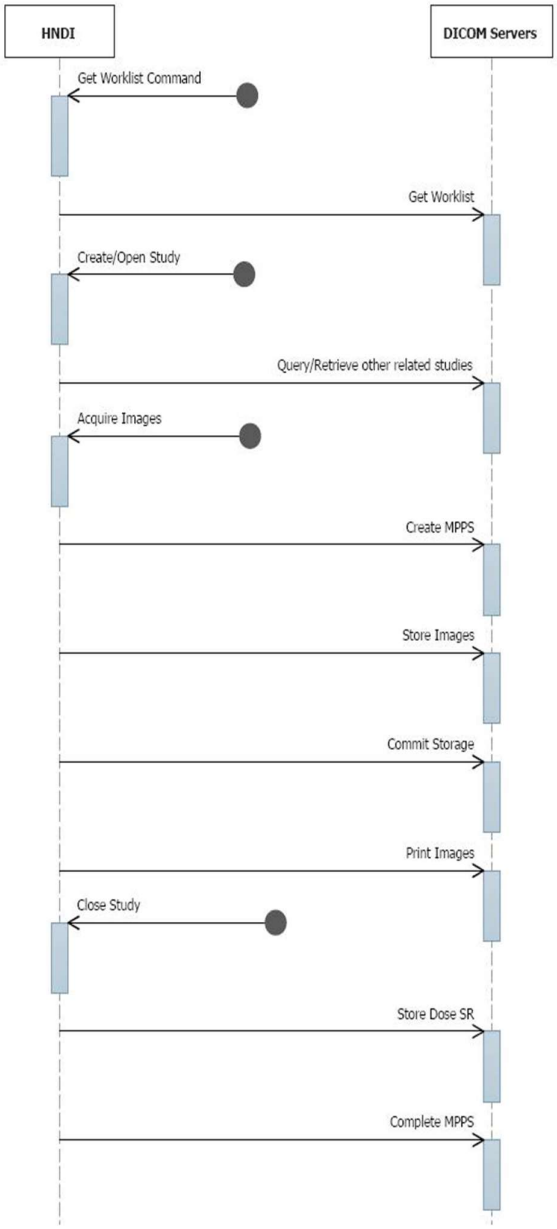
5.1.3 SEQUENCING OF REAL WORLD ACTIVITIES

The following picture shows the workflow at the modality and the sequencing of the activation of the DICOM services related to it.

The service execution sequence shown is merely representative of a typical case. In other real cases some of the services can be absent or can occur in a different time sequence, depending on supported optional services, on operator choice and modality settings.

In the following diagram all DICOM SCPs are grouped under the “DICOM Servers” label. In a real environment we can find a wide variety of grouping sets. All the services may be implemented in the same device/system or a single device can be dedicated to a restrict set of services.

The AET of the SCPs reflect the server-service layout. NDI can be programmed to use a dedicated AET for each service SCP.



5.2 AE SPECIFICATIONS

5.2.1 NDI AE SPECIFICATION

5.2.1.1 SOP Classes

NDI AE provides Standard Conformance to the following SOP Classes:

TABLE 5.2-1
SOP CLASSES FOR NDI

SOP CLASS NAME	SOP CLASS UID	SCU	SCP
Computed Radiology Image Storage	1.2.840.10008.5.1.4.1.1.1	Yes	Yes (1)
Digital X-Ray Image Storage for Presentation	1.2.840.10008.5.1.4.1.1.1.1	Yes	Yes (1)
X-Ray Angiographic Image Storage	1.2.840.10008.5.1.4.1.1.12.1	Yes	Yes (1)
X-Ray Radiofluoroscopic Image Storage	1.2.840.10008.5.1.4.1.1.12.2	Yes	Yes (1)
Modality Worklist	1.2.840.10008.5.1.4.31	Yes	No
Storage Commitment Push Model	1.2.840.10008.1.20.1	Yes	No
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Yes	No
Patient Root Q/R - FIND	1.2.840.10008.5.1.4.1.2.1.1	Yes	No
Patient Root Q/R – MOVE	1.2.840.10008.5.1.4.1.2.1.2	Yes	No
Study Root Q/R - FIND	1.2.840.10008.5.1.4.1.2.2.1	Yes	No
Study Root Q/R - MOVE	1.2.840.10008.5.1.4.1.2.2.2	Yes	No
Basic Grayscale Print Management	1.2.840.10008.5.1.1.9	Yes	No
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Yes	No

(1) The SCP role is assumed only during execution of Query/Retrieve service accepting C-STORE command following a C-MOVE.

5.2.1.2 Association Policies

5.2.1.2.1 General

The DICOM standard application context name for DICOM 3.0 is always proposed:

TABLE 5.2-2
DICOM APPLICATION CONTEXT

Application Context Name	1.2.840.10008.3.1.1.1

5.2.1.2.2 Number of Associations.

NDI initiates one Association at a time for storage and print service processing transfer request in the active job queue list. Only one job will be active at a time, the others remain pending until the active job is completed or failed. At the same time NDI can start an association for worklist, MPPS, storage commitment, verify, query/retrieve service.

TABLE 5.2-3
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION INITIATOR FOR NDI

Maximum number of simultaneous associations	2

TABLE 5.2-4
NUMBER OF ASSOCIATIONS AS AN ASSOCIATION ACCEPTOR FOR NDI

Maximum number of simultaneous associations	0

5.2.1.2.3 Asynchronous Nature

NDI does not support asynchronous communication.

5.2.1.2.4 Implementation Identifying Information

The implementation information for this Application Entity is:

TABLE 5.2-5
DICOM IMPLEMENTATION CLASS AND VERSION FOR NDI

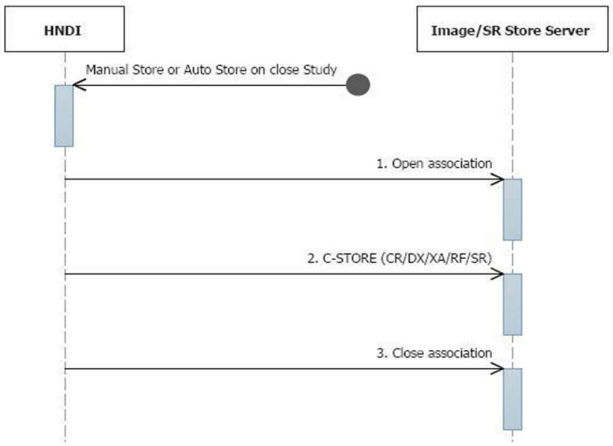
Implementation Class UID	1.3.76.6.1.1.5.1.1
Implementation Version Name	DIGITEC V5.1

5.2.1.3 Association Initiation Policy

5.2.1.3.1 Activity – Send Images or X-Ray Dose SR to a remote server

5.2.1.3.1.1 Description and Sequencing of Activities

NDI initiates an association to transfer images or X-Ray Dose Report using C-STORE DICOM service. Only one image or X-Ray Dose SR will be transferred on a single association. C-STORE return status is waited and job status is modified according to it. The following picture details the message flow and sequencing.



5.2.1.3.1.2 Proposed Presentation Contexts

NDI is capable of proposing the Presentation Contexts shown in the following table:

TABLE 5.2-6
PROPOSED PRESENTATION CONTEXTS FOR NDI STORAGE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
Digital X-Ray Image Storage – For Presentation SOP Class	1.2.840.10008.5.1.4.1.1.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
X-Ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	DICOM Jpeg Lossless non-hirarchical,First-order Prediction P14 Transfer Syntax	1.2.840.10008.1.2.4.70	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
X-Ray Radiofluoroscopic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2	DICOM Jpeg Lossless non-hirarchical,First-order Prediction P14 Transfer Syntax	1.2.840.10008.1.2.4.70	SCU	None
		DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2		
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None
		DICOM Explicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2.1		

5.2.1.3.1.3 SOP Specific Conformance for SOP Class(es)

All the DICOM transfer request and response are logged, together with tags and status details. The behavior of NDI AE when encountering status codes in a C-STORE response is summarized in the Table below:

TABLE 5.2-7
DICOM C-STORE COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	Job is marked as completed and removed from job queue

Any other error code			Association is released and job is marked as failed and a user warning is displayed

The behavior of the AE during communication failure is summarized in a table as follows:

TABLE 5.2-8
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

EXCEPTION	BEHAVIOR
Association fail	Job is marked as failed and a user warning is displayed.
Timeout	The Association is aborted using A-ABORT and job is marked as failed. The reason is logged and reported to the user.
Association aborted	Job is marked as failed and a user warning is displayed.

A failed send job can be restarted by user interaction. The system can be configured to automatically
resend failed jobs. The delay between resending failed jobs and the number of retries is also configurable.

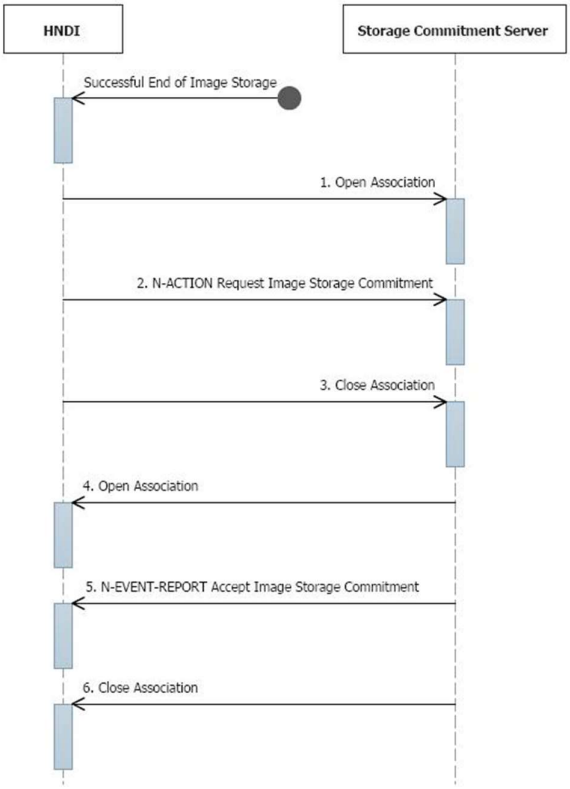
5.2.1.3.2 Activity – Request Storage Commitment to a Remote Server

5.2.1.3.2.1 Description and Sequencing of Activities

The system can be configured to request the storage commitment of each image transferred to a remote SCP with any of the above descripted storage services. This request starts an association negotiation for the *Storage Commitment Service.* The AET of the *Storage Commitment Service* SCP can be programmed; each programmed *Storage Service* SCP has an associated *Storage Commitment Service* SCP (storage commitment server on a modality base).

The acceptance of the commitment is expected to be transferred on a separate association started by the Storage Commitment Server AE.

The following picture details the message flow and sequencing.



5.2.1.3.2.2 Proposed Presentation Contexts

NDI is capable of proposing the Presentation Contexts shown in the following table:

TABLE 5.2-9
PROPOSED PRESENTATION CONTEXTS FOR NDI STORAGE COMMITMENT

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Storage Commitment SOP Class	1.2.840.10008.2.2 0.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

5.2.1.3.2.3 SOP Specific Conformance of Storage Commitment SOP Class

All the DICOM transfer request and response are logged, together with tags and status details.

- **N-ACTION** command

The behavior of NDI AE when encountering status codes in a N-ACTION response is summarized in the table below:

TABLE 5.2-10
DICOM STORAGE COMMITMENT N-ACTION
COMMAND RESPONSE STATUS HANDLING BEHAVIOR

SERVICE STATUS	FURTHER MEANING	ERROR CODE	BEHAVIOR
Success	Success	0000	The system close association and wait for N-EVENT-REPORT message on a separate association..
Any other error code			Transaction is marked as failed. Any transaction will be retried after a programmable delay and for a programmable number of times.

The behavior of the AE during communication failure is summarized in a table as follows:

TABLE 5.2-11
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

EXCEPTION	BEHAVIOR
Association fail	Transaction is marked as failed. Any transaction will be retried after a programmable delay and for a programmable number of times.
Timeout	
Association aborted	

The following table shows specific attributes used in N-ACTION command:

Table 5.2-12
Storage Commitment N-ACTION attributes

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Specific character set	(0008,0005)	CS		ANAP	CONFIG
Transaction UID	(0008,1195)	UI		ALWAYS	AUTO
Referenced SOP Sequence	(0008,1199)	SQ		ALWAYS	
> Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	AUTO
> Reference SOP Instance UID	(0008,1155)	UI		ALWAYS	AUTO

- **N-EVENT-REPORT** command

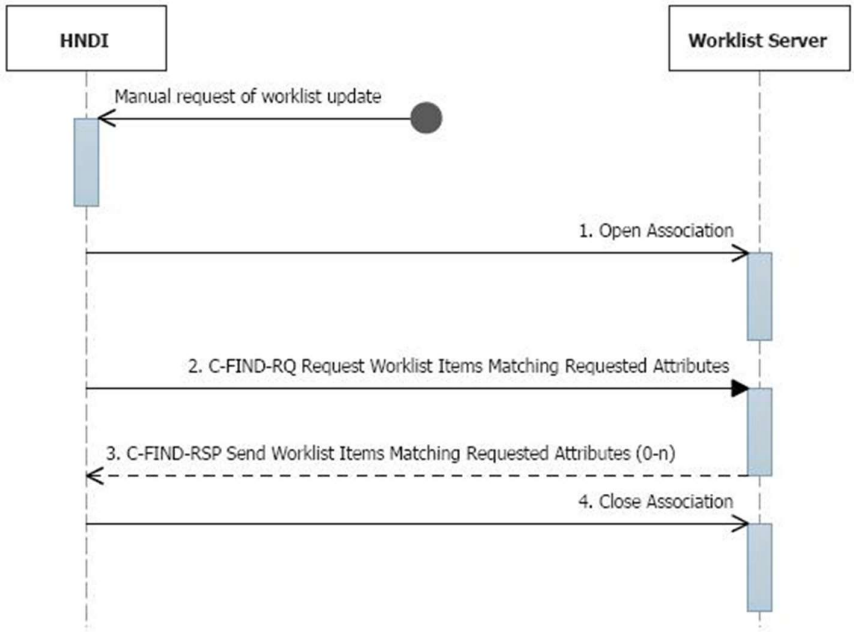
NDI accepts N-EVENT-REPORT only on an association separated from the N-ACTION one.

5.2.1.3.3 Activity – Request Modality Worklist to a Remote Server

5.2.1.3.3.1 Description and Sequencing of Activities

The request to get the worklist starts an association negotiation for the *Basic Worklist Management Service.* NDI requests a list of work studies to be executed at the current modality. The operator can filter the request by patient name (with wildcards), patient ID, date/time, accession number.

The following pictures shows the message flow and sequencing.


HNDI
Worklist Server
Manual request of worklist update
1. Open Association
2. C-FIND-RQ Request Worklist Items Matching Requested Attributes
3. C-FIND-RSP Send Worklist Items Matching Requested Attributes (0-n)
4. Close Association

5.2.1.3.3.2 Proposed Presentation Contexts

NDI is capable of proposing the Presentation Contexts shown in the following table:

TABLE 5.2-13
PROPOSED PRESENTATION CONTEXTS FOR NDI MODALITY WORKLIST

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Modality Worklist Information Model -FIND SOP Class	1.2.840.10008.5.1.4.31	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

5.2.1.3.3.3 SOP Specific Conformance of Modality Worklist SOP Class

All the DICOM transfer request and response are logged, together with tags and status details. The behavior of NDI AE when encountering status codes in a N-ACTION response is summarized in the table below:

TABLE 5.2-14
DICOM MODALITY WORKLIST C-FIND
COMMAND RESPONSE STATUS HANDLING BEHAVIOR

SERVICE STATUS	FURTHER MEANING	ERROR CODE	BEHAVIOR
Success	Success	0000	The working list is displayed in a dedicated dialog form.
Any other error code			The association is closed and an explicative error writing is displayed.

The behavior of the AE during communication failure is summarized in a table as follows:

TABLE 5.2-15
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

EXCEPTION	BEHAVIOR
Association fail	An explicative error writing is displayed.
Timeout	
Association aborted	

The following table shows specific attributes used in C-FIND-REQ command:

TABLE 5.2-16
MODALITY WORKLIST C-FIND-REQ ATTRIBUTES

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
Specific character set	(0008,0005)	CS		ANAP	CONFIG
Accession Number	(0008,0050)	SH	Single value	VNAP	USER
Referring Physician's Name	(0008,0090)	PN		EMPTY	
Referenced Study Sequence	(0008,1110)	SQ		ANAP	
Patient Name	(0010,0010)	PN	Single value / Wildcard	VNAP	USER
Patient ID	(0010,0020)	LO	Single value	VNAP	USER
Patient Birth Date	(0010,0030)	DA		EMPTY	
Patient Sex	(0010,0040)	CS		EMPTY	
Patient's Size	(0010,1020)	DS		ANAP	
Patient's Size Code Sequence	(0010,1021)	SQ		ANAP	
Patient's Weight	(0010,1030)	DS		ANAP	
Study Instance UID	(0020,000D)	UI		EMPTY	
Study ID	(0020,0010)	SH		EMPTY	
Requesting Physician	(0032,1032)	PN		EMPTY	
Requesting Service	(0032,1033)	LO		EMPTY	
Requested Procedure Description	(0032,1060)	LO		EMPTY	
Requested Procedure Code Sequence	(0032,1064)	SQ		EMPTY	

Scheduled Procedure Step Sequence	(0040,0100)	SQ		ALWAYS	
> Modality	(0008,0060)	CS	Single value or return key	VNAP	CONFIG
> Scheduled Station AE title	(0040,0001)	AE	Single value	VNAP	CONFIG
> Scheduled Procedure Step Start Date	(0040,0002)	DA	Single value / Range matching	VNAP	USER
> Scheduled Procedure Step Start Time	(0040,0003)	TM	Single value / Range matching	VNAP	USER
> Scheduled Performing Physician Name	(0040,0006)	PN		EMPTY	
> Scheduled Procedure Step Description	(0040,0007)	LO		EMPTY	
> Scheduled Protocol Code Sequence	(0040,0008)	SQ		EMPTY	
> Scheduled Procedure Step ID	(0040,0009)	SH		EMPTY	
> Scheduled Station Name	(0040,0010)	SH		EMPTY	
> Scheduled Procedure Step Location	(0040,0011)	SH		EMPTY	
Requested Procedure ID	(0040,1001)	SH	Single value	VNAP	USER

5.2.1.3.4 Activity – Creating and updating Modality Performed Procedure Step

5.2.1.3.4.1 Description and Sequencing of Activities

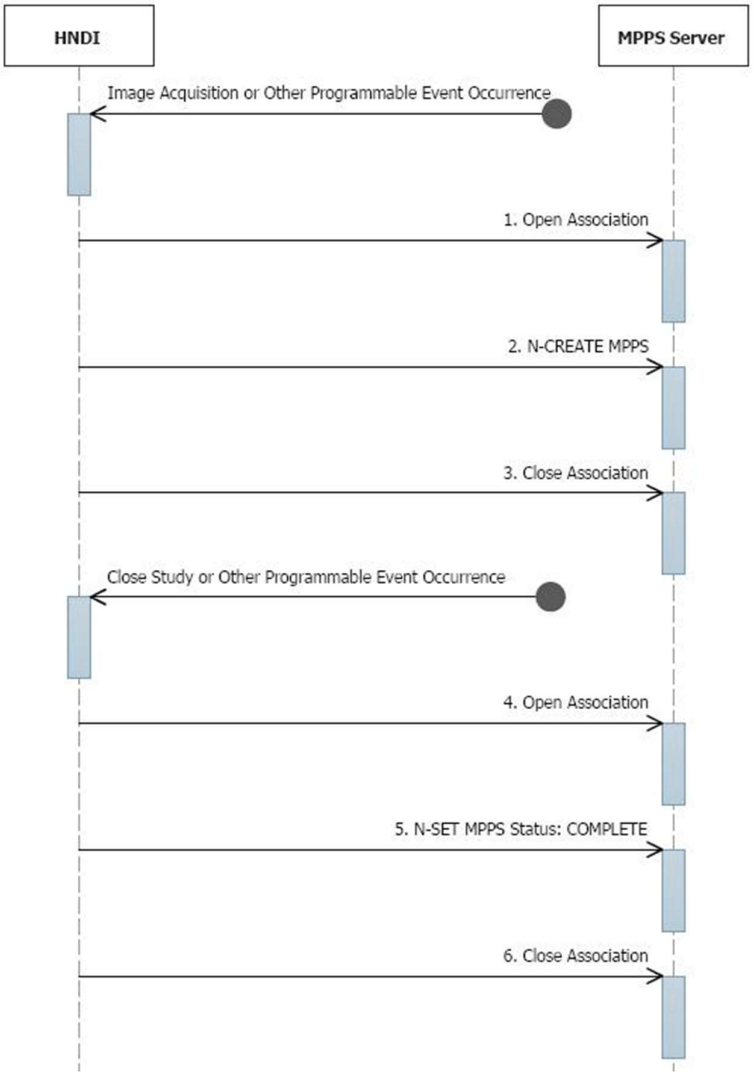
The system can be set to communicate to a remote server the acquisition of images related to the execution of a Scheduled Procedure Step. The acquired images IDs are inserted in a MPPS object to be sent remotely.

NDI starts an association of the *MPPS Service* to create and set an MPPS on the remote server.

The creation of an MPPS on the remote MPPS Server is started on the occurrence of specific events, such as *"End of Image Acquisition"* or *"Close Study".* The actual event starting MPPS service is programmable. The details of completion of the MPPS are programmable too.

If a MPPS related to the acquisition of images is in "in progress" status and new images are acquired with different "modality" attribute (i.e. CR/DX/XA/RF), the first MPPS is completed on the server and a new one is created for the new images.

The following pictures shows the message flow and sequencing for creation and set of MPPS on the server.



5.2.1.3.4.2 Proposed Presentation Contexts

NDI is capable of proposing the Presentation Contexts shown in the following table:

TABLE 5.2-17
PROPOSED PRESENTATION CONTEXTS FOR NDI MPPS

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Modality Performed	1.2.840.10008.3.1.2.3.3	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

Procedure Step SOP Class					

5.2.1.3.4.3 SOP Specific Conformance of Modality Performed Procedure Step Class

All the DICOM transfer request and response are logged, together with tags and status details. The behavior of NDI AE when encountering status codes in a N-CREATE/N-SET response is summarized in the table below:

TABLE 5.2-18
DICOM MPPS N-CREATE/N-SET
COMMAND RESPONSE STATUS HANDLING BEHAVIOR

SERVICE STATUS	FURTHER MEANING	ERROR CODE	BEHAVIOR
Success	Success	0000	The MPPS notification is internally marked as "successful"..
Any other error code			The association is closed and an explicative error writing is displayed.

The behavior of the AE during communication failure is summarized in a table as follows:

TABLE 5.2-19
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

EXCEPTION	BEHAVIOR
Association fail	An explicative error writing is displayed.
Timeout	
Association aborted	

The following table shows specific attributes used in N-CREATE/N-SET commands:

TABLE 5.2-20
MPPS N-CREATE/N-SET ATTRIBUTES

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE N-CREATE	PRESENCE OF VALUE N-SET	SOURCE
Specific character set	(0008,0005)	CS		ANAP	ANAP	CONFIG
Modality	(0008,0060)	CS		ALWAYS		AUTO/MWL
Procedure Code Sequence	(0008,1032)	SQ		VNAP		MWL/USER
Referenced Study Sequence	(0008,1110)	SQ		VNAP		MWL
>Referenced SOP Class UID	(0008,1150)	UI		ALWAYS		MWL
>Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS		MWL
Referenced Patient Sequence	(0008,1120)	SQ		EMPTY		
Patient Name	(0010,0010)	PN		ALWAYS		MWL/USER
Patient ID	(0010,0020)	LO		VNAP		MWL/USER
Patient Birth Date	(0010,0030)	DA		VNAP		MWL/USER
Patient Sex	(0010,0040)	CS		VNAP		MWL/USER

Image Area Dose Product	(0018,115E)	DS		VNAP	VNAP	AUTO
Study ID	(0020,0010)	SH		VNAP		MWL/USER/ AUTO
Performed Station AE title	(0040,0241)	AE		ALWAYS		CONFIG
Performed Station Name	(0040,0242)	SH		EMPTY		
Performed Location	(0040,0243)	SH		EMPTY		
Performed Procedure Step Start Date	(0040,0244)	DA		ALWAYS		AUTO
Performed Procedure Step Start Time	(0040,0245)	TM		ALWAYS		AUTO
Performed Procedure Step End Date	(0040,0250)	DA		EMPTY	ALWAYS	AUTO
Performed Procedure Step End Time	(0040,0251)	TM		EMPTY	ALWAYS	AUTO
Performed Procedure Step Status	(0040,0252)	CS		ALWAYS	ALWAYS	AUTO
Performed Procedure Step ID	(0040,0253)	SH		VNAP		MWL/USER
Performed Procedure Step Description	(0040,0254)	LO		VNAP	VNAP	MWL/USER
Performed Procedure Type Description	(0040,0255)	LO		VNAP	VNAP	MWL/USER
Performed Protocol Code Sequence	(0040,0260)	SQ		VNAP		MWL/USER
> Include "Code Sequence Macro"						
Scheduled Step Attribute Sequence	(0040,0270)	SQ		ALWAYS		
> Accession Number	(0008,0050)	SH		VNAP		MWL/USER
> Referenced Study Sequence	(0008,1110)	SQ		EMPTY		
> Study Instance UID	(0020,000D)	UI		ALWAYS		MWL/AUTO
> Requested Procedure Description	(0032,1060)	LO		VNAP		MWL/USER
> Scheduled Procedure Step Description	(0040,0007)	LO		VNAP		MWL/USER
> Scheduled Protocol Code Sequence	(0040,0008)	SQ		VNAP		MWL/USER
> Include "Code Sequence Macro"						
> Scheduled Procedure Step ID	(0040,0009)	SH		VNAP		MWL/USER
> Requested Procedure ID	(0040,1001)	SH		VNAP		MWL/USER
Total Time of Fluoroscopy	(0040,0300)	US		VNAP	VNAP	AUTO
Total Number of Exposures	(0040,0301)	US		VNAP	VNAP	AUTO
Exposure Dose Sequence	(0040,030E)	SQ		VNAP	VNAP	
> KVp	(0018,0060)	DS		VNAP	VNAP	AUTO
> Exposure Time	(0018,1150)	IS		VNAP	VNAP	AUTO
> Radiation Mode	(0018,115A)	CS		VNAP	VNAP	AUTO
> X-ray Tube Current in uA	(0018,8151)	DS		VNAP	VNAP	AUTO
Comments on Radiation Dose	(0040,0310)	ST		EMPTY	EMPTY	
Performed Series Sequence	(0040,0340)	SQ		VNAP	VNAP	
> Retrieve AE Title	(0008,0054)	AE		EMPTY	EMPTY	

> Series Description	(0008,103E)	LO		EMPTY	EMPTY	
> Performing Physician's Name	(0008,1050)	PN		VNAP	VNAP	MWL/USER
> Operator's Name	(0008,1070)	PN		EMPTY	EMPTY	
> Referenced Image Sequence	(0008,1140)	SQ		ALWAYS	ALWAYS	
>> Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	ALWAYS	AUTO
>> Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS	ALWAYS	AUTO
> Protocol Name	(0018,1030)	LO		VNAP	VNAP	CONFIG
> Series Instance UID	(0020,000E)	UI		ALWAYS	ALWAYS	AUTO
> Referenced Non-Image Composite SOP Instance Sequence	(0040,0220)	SQ		EMPTY	EMPTY	

5.2.1.3.5 Activity – Print Images using a Remote Hardcopy Printer

5.2.1.3.5.1 Description and Sequencing of Activities

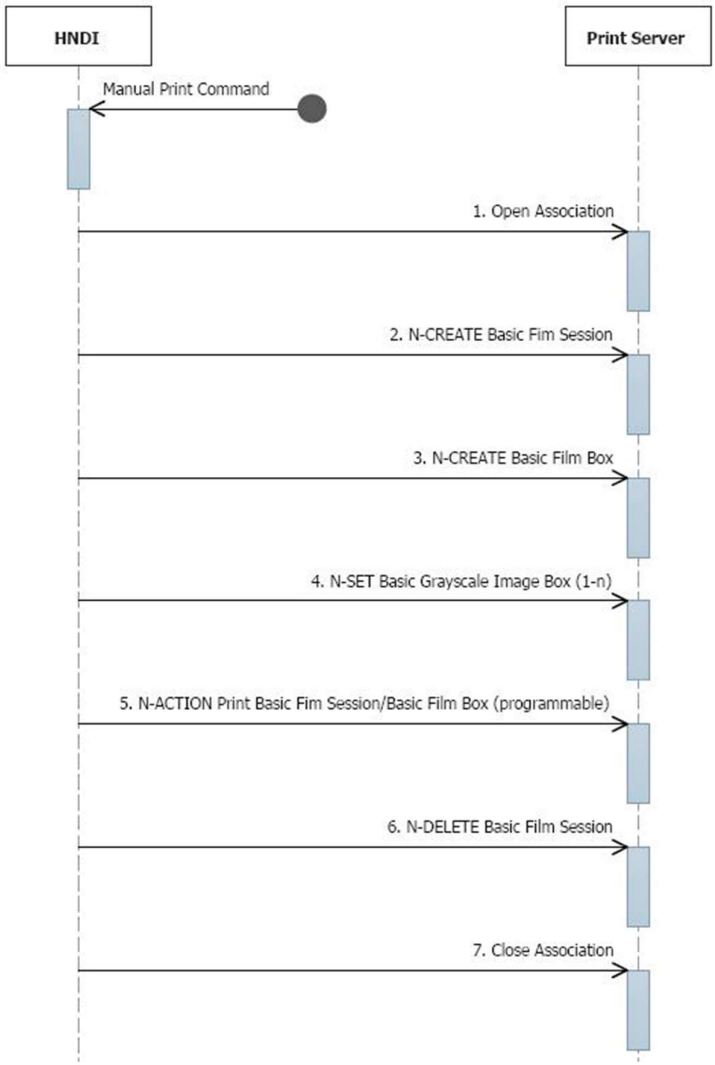
NDI can send images to a DICOM printer using the *Basic Grayscale Print Management Service.* On an operator request to print one or more film, NDI negotiates an association to it.

NDI open an association for each film to be printed.

The operator can activate a direct print of the frame currently displayed; a single frame print film (STANDARD 1\1 format) is requested to the Print Server. Alternatively the modality has a film editor module giving the operator the possibility to select the film layout among those supported by the printer, to choose the frame to insert in any image box and to set other print parameters (film destination, print priority etc.).

The capabilities of each printer are loaded from a dedicated printer setup files. These files match the device features declared in the Printer DICOM Conformance Statement and in the Technical Manual.

The following pictures shows the message flow and sequencing.


HNDI
Print Server
Manual Print Command
1. Open Association
2. N-CREATE Basic Fim Session
3. N-CREATE Basic Film Box
4. N-SET Basic Grayscale Image Box (1-n)
5. N-ACTION Print Basic Fim Session/Basic Film Box (programmable)
6. N-DELETE Basic Film Session
7. Close Association

5.2.1.3.5.2 Proposed Presentation Contexts

NDI is capable of proposing the Presentation Contexts shown in the following table:

TABLE 5.2-21
PROPOSED PRESENTATION CONTEXTS FOR NDI

PRESENTATION CONTEXT TABLE					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

5.2.1.3.5.3 SOP Specific Conformance Common to all SOP Classes

All the DICOM transfer request and response are logged, together with tags and status details. The behavior of the AE during communication failure is summarized in a table as follows:

TABLE 5.2-22
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

EXCEPTION	BEHAVIOR
Association fail	Job is marked as failed and a user warning is displayed.
Timeout	The Association is aborted using A-ABORT and job is marked as failed. The reason is logged and reported to the user.
Association aborted	Job is marked as failed and a user warning is displayed.

A failed send job can be restarted by user interaction. The system can be configured to automatically
resend failed jobs. The delay between resending failed jobs and the number of retries is also configurable.

5.2.1.3.5.4 SOP Specific Conformance of Basic Film Session SOP Class

The following commands are used: N-CREATE, N-ACTION, N-DELETE.
The behavior of NDI AE when encountering status codes in a N-CREATE/N-ACTION/N-DELETE response is summarized in the Table below:

TABLE 5.2-23
DICOM BASIC FILM SESSION N-CREATE/N-ACTION/N-DELETE
COMMAND RESPONSE STATUS HANDLING BEHAVIOR

SERVICE STATUS	FURTHER MEANING	ERROR CODE	BEHAVIOR
Success	Success	0000	N-CREATE/N-ACTION: the operations continue. N-DELETE: the association is closed and the local copy of the session is destroyed.
Any other error code			The error code is associated to the local copy of the session job and the association is closed.

N-CREATE. This command will be used to create a Film Session instance. The following table shows specific attributes.

TABLE 5.2-24
BASIC FILM SESSION N-CREATE ATTRIBUTES

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Specific character set	(0008,0005)	CS		ANAP	CONFIG
Number of Copies	(2000,0010)	IS		ALWAYS	USER/CONFIG
Print Priority	(2000,0020)	CS		VNAP	USER/CONFIG
Medium Type	(2000,0030)	CS		VNAP	USER/CONFIG
Film Destination	(2000,0040)	CS		VNAP	USER/CONFIG

Film Session Label	(2000,0050)	LO		EMPTY	

N-ACTION. This command will be used to create a Print Job Instance to print the whole printing session. No specific attribute will be included. Depending on SCP capabilities, SCU can be configured to print whole session in a single Print Job or to print each film by mean of separated N-ACTION Print Film Box services (see Basic Film Box SOP Class).

N-DELETE. This command will be used to delete the whole Print Session after the Print Job instance creation.

5.2.1.3.5.5 SOP Specific Conformance of Basic Film Box SOP Class

The following commands are used: N-CREATE, N-ACTION.
The behavior of NDI AE when encountering status codes in a N-CREATE/N-ACTION response is summarized in the table below:

TABLE 5.2-25
DICOM BASIC FILM BOX N-CREATE/N-ACTION
COMMAND RESPONSE STATUS HANDLING BEHAVIOR

SERVICE STATUS	FURTHER MEANING	ERROR CODE	BEHAVIOR
Success	Success	0000	The operations continue.
Any other error code			The error code is associated to the local copy of the session job and the association is closed.

N-CREATE. This command will be used to create a Film Box instance. The following table shows specific service attributes.

TABLE 5.2-26
BASIC FILM BOX N-CREATE ATTRIBUTES

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Specific character set	(0008,0005)	CS		ANAP	CONFIG
Image Display Format	(2010,0010)	ST		ALWAYS	USER/CONFIG
Annotation Display Format ID	(2010,0030)	CS		EMPTY	
Film orientation	(2010,0040)	CS		ALWAYS	USER/CONFIG
Film Size ID	(2010,0050)	CS		ALWAYS	USER/CONFIG
Magnification Type	(2010,0060)	CS		VNAP	USER/CONFIG
Smoothing Type	(2010,0080)	CS		VNAP	USER/CONFIG
Border Density	(2010,0100)	CS		VNAP	USER/CONFIG
Empty Image Density	(2010,0110)	CS		VNAP	USER/CONFIG
Trim	(2010,0140)	CS		VNAP	USER/CONFIG
Referenced Film Session Sequence	(2010,0500)	SQ		ALWAYS	
>Referenced SOP Class UID	(0008,1150)	UI		ALWAYS	AUTO

>Referenced SOP Instance UID	(0008,1155)	UI		ALWAYS	AUTO
Requested Resolution ID	(2020,0050)	CS		VNAP	USER/CONFIG

N-ACTION. This command will be used to create a Print Job Instance to print a single Film Box. No specific attribute will be included. Depending on SCP capabilities, SCU can be configured to print each film box separately or to print the whole print session by mean of the N-ACTION Print Film Session service (see Basic Film Session SOP Class).

5.2.1.3.5.6 SOP Specific Conformance of Basic Grayscale Image Box SOP Class

The following command a are used: N-SET.
The behavior of NDI AE when encountering status codes in a N-SET response is summarized in the table below:

TABLE 5.2-27
DICOM BASIC GRAYSCALE IMAGE BOX N-SET

COMMAND RESPONSE STATUS HANDLING BEHAVIOR

SERVICE STATUS	FURTHER MEANING	ERROR CODE	BEHAVIOR
Success	Success	0000	The operations continue.
Any other error code			The error code is associated to the local copy of the session job and the association is closed.

N-SET. This command will be used to update a Grayscale Image instance. The following table shows specific service attributes.

TABLE 5.2-28
BASIC BASIC GRAYSCALE IMAGE BOX N-SET ATTRIBUTES

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Specific character set	(0008,0005)	CS		ANAP	CONFIG
Image Box Position	(2020,0010)	US	Fixed: 1	ALWAYS	FIX
Basic Grayscale Image Sequence	(2020,0110)	SQ		ALWAYS	
>Samples per Pixel	(0028,0002)	US	Fixed: 1	ALWAYS	FIX
>Photometric Interpretation	(0028,0004)	CS	Fixed: MONOCHROME2	ALWAYS	FIX
>Rows	(0028,0010)	US		ALWAYS	AUTO
>Columns	(0028,0011)	US		ALWAYS	AUTO
>Bits Allocated	(0028,0100)	US	8,16 (Matches printer capabilities)	ALWAYS	AUTO/CONFIG
>Bits Stored	(0028,0101)	US	8-16 (Matches printer capabilities)	ALWAYS	AUTO/CONFIG
>High Bit	(0028,0102)	US	(BitsStored-1)-(BitsAllocated-1) (Matches printer capabilities)	ALWAYS	AUTO/CONFIG
>Pixel Representation	(0028,0103)	US	Fixed: 0	ALWAYS	FIX

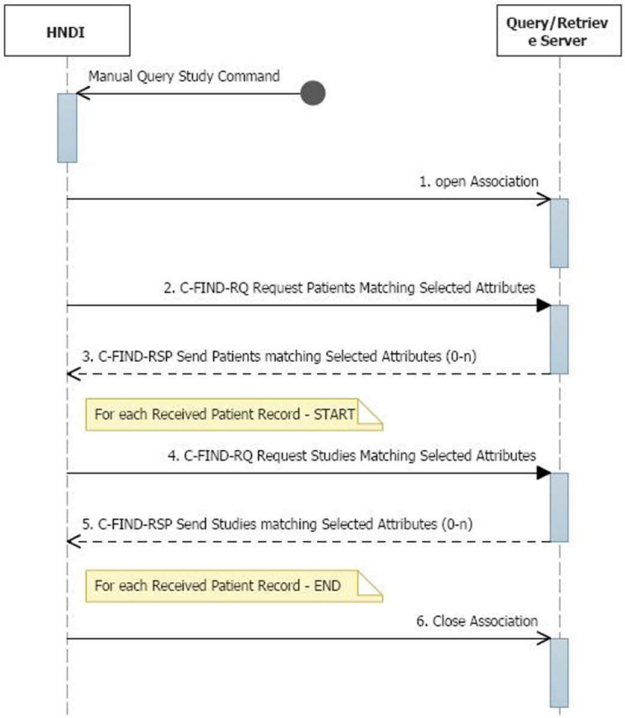
>Pixel Data	(7FE0,0010)	OB /O W		ALWAYS	AUTO

5.2.1.3.6 Activity – Querying and Retrieving Studies

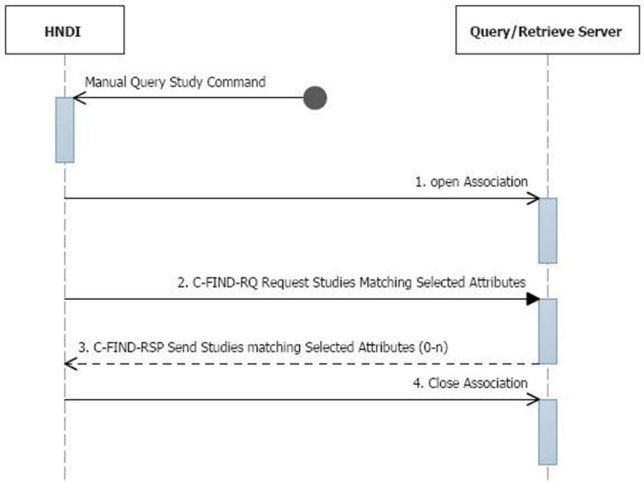
5.2.1.3.6.1 Description and Sequencing of Activities

The operator can select a set of key used by NDI to find useful studies on a remote DICOM archive. The remote DICOM AE sends back a list of matching studies. According to DICOM Standard, NDI can query studies both in Patient Root Mode and Study Root Mode.

The following pictures shows the message flow and sequencing during a query of the study list in Patient Root Mode.

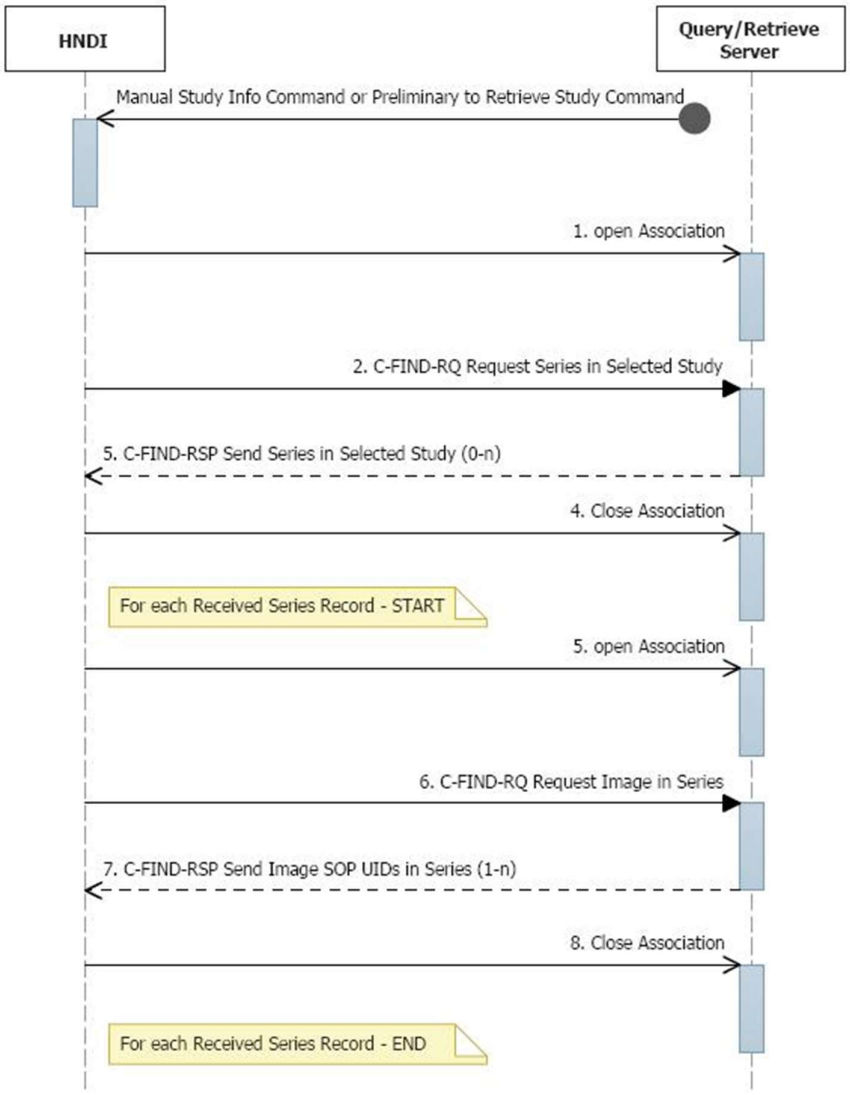

HNDI
Query/Retriev e Server
Manual Query Study Command
1. open Association
2. C-FIND-RQ Request Patients Matching Selected Attributes
3. C-FIND-RSP Send Patients matching Selected Attributes (0-n)
For each Received Patient Record - START
4. C-FIND-RQ Request Studies Matching Selected Attributes
5. C-FIND-RSP Send Studies matching Selected Attributes (0-n)
For each Received Patient Record - END
6. Close Association

The following pictures shows the message flow and sequencing during a query of the study list in Study Root Mode.

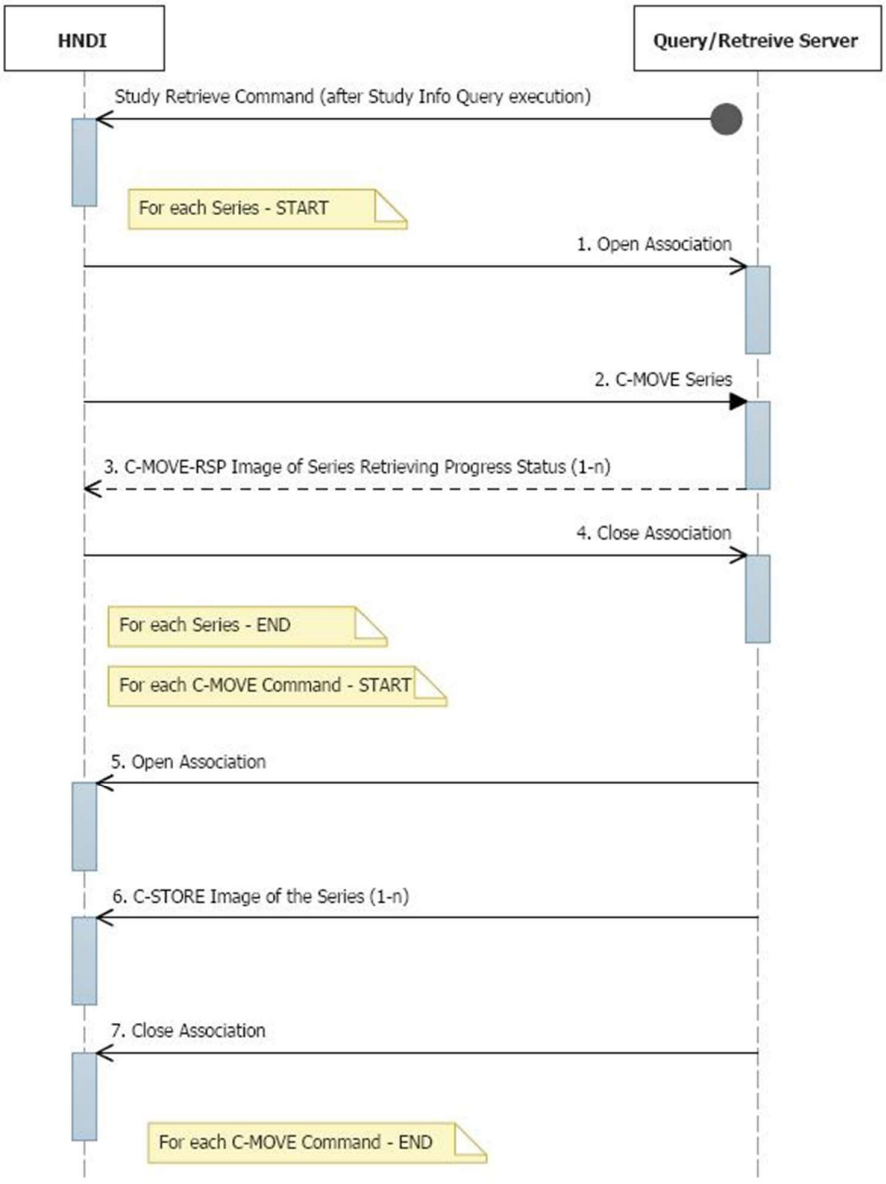

HNDI
Query/Retrieve Server
Manual Query Study Command
1. open Association
2. C-FIND-RQ Request Studies Matching Selected Attributes
3. C-FIND-RSP Send Studies matching Selected Attributes (0-n)
4. Close Association

The operator selects one or more studies to be retrieved by NDI interface. The retrieved studies, stored locally in DICOM 3.0 PS 10 (DICOMDIR file set) can be displayed but they cannot be modified. To delete the retrieved studies a dedicated command is provided.

The following pictures shows the message flow and sequencing during the query of the detailed descending tree (study – series – image) of a selected study.


HNDI
Query/Retrieve Server
Manual Study Info Command or Preliminary to Retrieve Study Command
1. open Association
2. C-FIND-RQ Request Series in Selected Study
5. C-FIND-RSP Send Series in Selected Study (0-n)
4. Close Association
For each Received Series Record - START
5. open Association
6. C-FIND-RQ Request Image in Series
7. C-FIND-RSP Send Image SOP UIDs in Series (1-n)
8. Close Association
For each Received Series Record - END

The following picture shows the message flow and sequencing during the retrieve of the images belonging to a selected study. Images are identified by means of the class and instance UIDs received during the execution of the query commands.


HNDI
Query/Retreive Server
Study Retrieve Command (after Study Info Query execution)
For each Series - START
1. Open Association
2. C-MOVE Series
3. C-MOVE-RSP Image of Series Retrieving Progress Status (1-n)
4. Close Association
For each Series - END
For each C-MOVE Command - START
5. Open Association
6. C-STORE Image of the Series (1-n)
7. Close Association
For each C-MOVE Command - END

5.2.1.3.6.2 Finding Studies

5.2.1.3.6.2.1 Proposed Presentation Contexts

Each remote Query/Retrieve SCP peer shall be configured to operate in one of the two standard mode: “Patient Root Query/Retrieve” or “Study Root Query/Retrieve”; a dedicated dialog allows the setup of the operation mode on a per remote server basis.

NDI is capable of proposing the Presentation Contexts shown in the following tables:

TABLE 5.2-29
PROPOSED PRESENTATION CONTEXT FOR NDI PATIENT ROOT Q/R IM - FIND

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Patient Root Q/R IM – FIND SOP Class	1.2.840.10008.5.1.4.1.2.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

TABLE 5.2-30
PROPOSED PRESENTATION CONTEXT FOR NDI STUDY ROOT Q/R IM - FIND

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Study Root Q/R IM – FIND SOP Class	1.2.840.10008.5.1.4.1.2.2.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

5.2.1.3.6.2.2 4.2.1.3.6.2.2 SOP Specific Conformance Common to all SOP Classes

All the DICOM transfer request and response are logged, together with tags and status details. The behavior of NDI AE when encountering status codes in a C-FIND response is summarized in the table below:

TABLE 5.2-31
DICOM PATIENT/STUDY ROOT Q/R IM – FIND
COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The records received are displayed.
Any other error code			The results already received up to that point are displayed to the operator and the error reason is shown and logged.

The behavior of the AE during communication failure is summarized in a table as follows:

Table 5.2-32
DICOM Command Communication Failure Behavior

Exception	Behavior
Association fail	The results already received up to that point are displayed to the operator and the error reason is shown and logged.
Timeout	
Association aborted	

5.2.1.3.6.2.3 SOP Specific Conformance of Patient Root Q/R IM – FIND SOP Class

The following tables shows specific attributes.

TABLE 5.2-33
PATIENT ROOT Q/R IM - FIND: PATIENT LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
Patient's Name	(0010,0010)	PN	Single Value matching or Wild Card matching or Universal matching	VNAP	USER
Patient ID	(0010,0020)	LO	Single Value matching or Universal matching	VNAP	USER
Patient's Birth Date	(0010,0030)	DA	Universal matching	EMPTY	
Patient's Sex	(0010,0040)	CS	Universal matching	EMPTY	

TABLE 5.2-34
PATIENT ROOT Q/R IM - FIND: STUDY LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
Study Date	(0008,0020)	DA	Universal matching	EMPTY	
Study Time	(0008,0030)	TM	Universal matching	EMPTY	
Accession Number	(0008,0050)	SH	Universal matching	EMPTY	
Modalities In Study	(0008,0061)	CS	Universal matching	EMPTY	
Study Description	(0008,1030)	LO	Universal matching	EMPTY	
Patient's Name	(0010,0010)	PN	Single Value matching or Universal matching	VNAP	AUTO
Patient ID	(0010,0020)	LO	Single Value matching or Universal matching	VNAP	AUTO
Study Instance UID	(0020,000D)	UI	Universal matching	EMPTY	
Study ID	(0020,0010)	SH	Universal matching	EMPTY	
Number of Study Related Instances	(0020,1208)	IS	Universal matching	EMPTY	

TABLE 5.2-35
PATIENT ROOT Q/R IM - FIND: SERIES LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
Modality	(0008,0060)	CS	Universal matching	EMPTY	
Patient ID	(0010,0020)	LO	Single Value matching	VNAP	AUTO
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Universal matching	EMPTY	
Series Number	(0020,0011)	IS	Universal matching	EMPTY	

TABLE 5.2-36
PATIENT ROOT Q/R IM - FIND: COMPOSITE OBJECT INSTANCE LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
SOP Class UID	(0008,0016)	UI	Universal matching	EMPTY	

SOP Instance UID	(0008,0018)	UI	Universal matching	EMPTY	
Patient ID	(0010,0020)	LO	Single Value matching	VNAP	AUTO
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Single Value matching	ALWAYS	AUTO
Instance Number	(0020,0013)	IS	Universal matching	EMPTY	

5.2.1.3.6.2.4 SOP Specific Conformance of Study Root Q/R IM – FIND SOP Class

The following tables shows specific attributes.

TABLE 5.2-37
STUDY ROOT Q/R IM - FIND: STUDY LEVEL KEYS

Attribute Name	Tag	VR	Matching Type	Presence of Value	Source
Study Date	(0008,0020)	DA	Universal matching	EMPTY	
Study Time	(0008,0030)	TM	Universal matching	EMPTY	
Accession Number	(0008,0050)	SH	Universal matching	EMPTY	
Modalities In Study	(0008,0061)	CS	Universal matching	EMPTY	
Study Description	(0008,1030)	LO	Universal matching	EMPTY	
Patient's Name	(0010,0010)	PN	Single Value matching or Wild Card matching or Universal matching	VNAP	USER
Patient ID	(0010,0020)	LO	Single Value matching or Universal matching	VNAP	USER
Patient's Birth Date	(0010,0030)	DA	Universal matching	EMPTY	
Patient's Sex	(0010,0040)	CS	Universal matching	EMPTY	
Study Instance UID	(0020,000D)	UI	Universal matching	EMPTY	
Study ID	(0020,0010)	SH	Universal matching	EMPTY	
Number of Study Related Instances	(0020,1208)	IS	Universal matching	EMPTY	

TABLE 5.2-38
STUDY ROOT Q/R IM - FIND: SERIES LEVEL KEYS

Attribute Name	Tag	VR	Matching Type	Presence of Value	Source
Modality	(0008,0060)	CS	Universal matching	EMPTY	
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Universal matching	ALWAYS	AUTO
Series Number	(0020,0011)	IS	Universal matching	EMPTY	

TABLE 5.2-39
STUDY ROOT Q/R IM - FIND: COMPOSITE OBJECT INSTANCE LEVEL KEYS

Attribute Name	Tag	VR	Matching Type	Presence of Value	Source
SOP Class UID	(0008,0016)	UI	Universal matching	EMPTY	
SOP Instance UID	(0008,0018)	UI	Universal matching	EMPTY	
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Single Value matching	ALWAYS	AUTO

Instance Number	(0020,0013)	IS	Universal matching	EMPTY	

5.2.1.3.6.3 Retrieving Studies

5.2.1.3.6.3.1 Proposed Presentation Contexts

Each remote Query/Retrieve SCP peer must be be configured to operate in one of the two standard mode: "Patient Root Query/Retrieve" or "Study Root Query/Retrieve"; a dedicated dialog allows the setup of the operation mode on a per remote server basis.

NDI is capable of proposing the Presentation Contexts shown in the following tables:

TABLE 5.2-40
PROPOSED PRESENTATION CONTEXT FOR NDI PATIENT ROOT Q/R IM - MOVE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Patient Root Q/R IM – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.1.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

TABLE 5.2-41
PROPOSED PRESENTATION CONTEXT FOR NDI STUDY ROOT Q/R IM - MOVE

Presentation Context Table					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Study Root Q/R IM – MOVE SOP Class	1.2.840.10008.5.1.4.1.2.2.2	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

5.2.1.3.6.3.2 SOP Specific Conformance Common to all SOP Classes

All the DICOM transfer request and response are logged, together with tags and status details. The behavior of NDI AE when encountering status codes in a C-MOVE response is summarized in the table below:

TABLE 5.2-42
DICOM PATIENT/STUDY ROOT Q/R IM – MOVE
COMMAND RESPONSE STATUS HANDLING BEHAVIOR

Service Status	Further Meaning	Error Code	Behavior
Success	Success	0000	The system wait for image instances to be received in a C-STORE separate association.
Any other error code			The error reason is shown and logged.

The behavior of the AE during communication failure is summarized in a table as follows:

TABLE 5.2-43
DICOM COMMAND COMMUNICATION FAILURE BEHAVIOR

EXCEPTION	BEHAVIOR
Association fail	The error reason is shown and logged.
Timeout	
Association aborted	

5.2.1.3.6.3.3 SOP Specific Conformance of Patient Root Q/R IM – MOVE SOP Class

The following tables shows specific attributes.

TABLE 5.2-44
PATIENT ROOT Q/R IM - MOVE: STUDY LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
Patient ID	(0010,0020)	LO	Single Value matching	ALWAYS	AUTO
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO

TABLE 5.2-45
PATIENT ROOT Q/R IM - MOVE: SERIES LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
Patient ID	(0010,0020)	LO	Single Value matching	ALWAYS	AUTO
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Single Value matching	ALWAYS	AUTO

TABLE 5.2-46
PATIENT ROOT Q/R IM - MOVE: COMPOSITE OBJECT INSTANCE LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
SOP Instance UID	(0008,0018)	UI	Single Value matching	ALWAYS	AUTO
Patient ID	(0010,0020)	LO	Single Value matching	ALWAYS	AUTO
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Single Value matching	ALWAYS	AUTO

5.2.1.3.6.3.4 SOP Specific Conformance of Study Root Q/R IM – MOVE SOP Class

The following tables shows specific attributes.

TABLE 5.2-47
STUDY ROOT Q/R IM - MOVE: STUDY LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO

TABLE 5.2-48
STUDY ROOT Q/R IM - MOVE: SERIES LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Single Value matching	ALWAYS	AUTO

TABLE 5.2-49
STUDY ROOT Q/R IM - MOVE: COMPOSITE OBJECT INSTANCE LEVEL KEYS

ATTRIBUTE NAME	TAG	VR	MATCHING TYPE	PRESENCE OF VALUE	SOURCE
SOP Instance UID	(0008,0018)	UI	Single Value matching	ALWAYS	AUTO
Study Instance UID	(0020,000D)	UI	Single Value matching	ALWAYS	AUTO
Series Instance UID	(0020,000E)	UI	Single Value matching	ALWAYS	AUTO

5.2.1.4 Association Acceptance Policy

5.2.1.4.1 Activity – Receive Storage Commitment Response from a Remote Server

5.2.1.4.1.1 Description and Sequencing of Activities

NDI accept Storage Commitment Response (conveyed on a N-EVENT-REPORT command) from a Remote SCP only on an association separate from the original one. The new association must be started by SCP entity. On receiving a Storage Commitment Response the related transaction is removed from outstanding queue and the associated image is marked as committed.

5.2.1.4.1.2 Accepted Presentation Contexts

NDI is capable of accepting the Presentation Contexts shown in the following table:

TABLE 5.2-50
ACCEPTED PRESENTATION CONTEXTS FOR NDI STORAGE COMMITMENT

PRESENTATION CONTEXT TABLE					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation
Storage Commitment SOP Class	1.2.840.10008.2.20.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCU	None

5.2.1.4.1.3 SOP Specific Conformance of Storage Commitment SOP Class

All the DICOM transfer request and response are logged, together with tags and status details.

- **N-EVENT-REPORT** command

The behavior and the response status of NDI following a N-EVENT-REPORT request is shown in the following table:

TABLE 5.2-51
DICOM STORAGE COMMITMENT N-EVENT-REPORT
RETURNED STATUS AND ACTIONS

SERVICE STATUS	FURTHER MEANING	ERROR CODE	BEHAVIOR

Success	Success	0000	If the transaction is still active and the commitment has been accepted, the images listed in the transaction are marked as commited and can be deleted (if the option "enable deleting image only if storage commited" is set). For all refused commitment, related transaction is marked as failed. Any transaction will be retried after a programmable delay and for a programmable number of times.

NDI support specific attributes in a received N-EVENT-REPORT as shown in the following table:

TABLE 5.2-52
STORAGE COMMITMENT N-EVENT-REPORT ACCEPTED ATTRIBUTES

ATTRIBUTE NAME	TAG	VR	VALUE
Specific character set	(0008,0005)	CS	
Retrieve AE Title	(0008,0054)	AE	
Transaction UID	(0008,1195)	UI	
Failed SOP Sequence	(0008,1198)	SQ	
> Referenced SOP Class UID	(0008,1150)	UI	
> Reference SOP Instance UID	(0008,1155)	UI	
> Failure Reason	(0008,1197)	US	
Referenced SOP Sequence	(0008,1199)	SQ	
> Retrieve AE Title	(0008,0054)	AE	
> Referenced SOP Class UID	(0008,1150)	UI	
> Reference SOP Instance UID	(0008,1155)	UI	
> Storage Media File-Set ID	(0088,0130)	SH	
> Storage Media File-Set UID	(0088,0140)	UI	
Storage Media File-Set ID	(0088,0130)	SH	
Storage Media File-Set UID	(0088,0140)	UI	

5.2.1.4.2 Activity – Receive Remote Image instances

5.2.1.4.2.1 Description and Sequencing of Activities

The reception of images on a C-STORE association is enabled only as an activity following a Query/Retrieve C-MOVE command. Images are stored in system archive and grouped in studies to be displayed.

5.2.1.4.2.2 Accepted Presentation Contexts

NDI is capable of accepting the Presentation Contexts shown in the following table:

TABLE 5.2-53
ACCEPTED PRESENTATION CONTEXTS FOR NDI STORAGE

PRESENTATION CONTEXT TABLE					
Abstract Syntax		Transfer Syntax		Role	Extended
Name	UID	Name List	UID List		Negotiation

Computed Radiography Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	None
Digital X-Ray Image Storage – For Presentation SOP Class	1.2.840.10008.5.1.4.1.1.1.1	DICOM Implicit VR Little Endian Transfer Syntax	1.2.840.10008.1.2	SCP	None
X-Ray Angiographic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.1	Jpeg Lossless non-hirarchical,First-order Prediction P14 Transfer Syntax	1.2.840.10008.1.2.4.70	SCP	None
X-Ray Radiofluoroscopic Image Storage SOP Class	1.2.840.10008.5.1.4.1.1.12.2	Jpeg Lossless non-hirarchical,First-order Prediction P14 Transfer Syntax	1.2.840.10008.1.2.4.70	SCP	None

5.2.1.4.2.3 SOP Specific Conformance of Storage SOP Classes

All the DICOM transfer request and response are logged, together with tags and status details. The behavior and the response status of NDI following a C-STORE request is shown in the following table:

TABLE 5.2-54
DICOM C-STORE RETURNED STATUS AND ACTIONS

SERVICE STATUS	FURTHER MEANING	ERROR CODE	BEHAVIOR
Success	Success	0000	The image instance is store on disk in Dicom Media format. All DICOM attributes received are inserted in the saved image IOD.

5.3 NETWORK INTERFACES

5.3.1 PHYSICAL NETWORK INTERFACE

INSIDE_SW provides TCP/IP Network Communication Support as defined in Part 8 of the DICOM Standard. The application uses TCP/IP stack of the operating system where it runs.

5.3.2 ADDITIONAL PROTOCOLS

None.

5.3.2.1 IPv4 and IPv6 Support

INSIDE_SW supports IPv4 only.

5.4 CONFIGURATION

A number of operating parameters can be configured by the operator. The " INSIDE_SW User Manual" describes how to setup network information and communication parameters from the "DICOM Setup dialog".

5.4.1 AE TITLE/PRESENTATION ADDRESS MAPPING

5.4.1.1 Local AE Title.

The following table specifies the local AET mapping and configuration:

TABLE 5.4-1
LOCAL AE PROGRAMMING

APPLICATION ENTITY	DEFAULT AE TITLE	DEFAULT TCP/IP PORT
NDI	INSIDE	104

5.4.1.2 Remote AE Title/Presentation Address Mapping

A maximum of 30 remote AE can be configured. For each one the user shall specify AET, IP address, port number and the capabilities as SCP/SCU.

For each hardcopy printer model supported an xml configuration file details the supported value of printing attributes (medium types, film sizes, film formats etc.).

6 MEDIA INTERCHANGE

Digitec INSIDE_SW is equipped with a *INSIDE_SW Media Storage Interface* (MSI) that allows the creation of a CD-R/DVD file-set according with DICOM 3.0 standard.

This document describes the conformance of MSI to DICOM 3.0 standard.

6.1 IMPLEMENTATION MODEL

MSI is an application capable to convert local storage images in a file set on a study base and to write the file set to a CD-R or to a DVD.

6.1.1 APPLICATION DATA FLOW DIAGRAM

Figure 6.1-1.
Application Data Flow Diagram

6.1.2 FUNCTIONAL DEFINITIONS OF AE'S

The user starts the creation of a file-set by means of a dedicated command. The minimum data unit selectable is the study.

6.1.3 SEQUENCING OF REAL WORLD ACTIVITIES

Not applicable.

6.1.4 FILE META INFORMATION FOR IMPLEMENTATION CLASS AND VERSION

The implementation information written to the File Meta Header in each file is:

TABLE 6.1-1
DICOM IMPLEMENTATION CLASS AND VERSION FOR MSI

Implementation Class UID	1.3.76.6.1.1.5.1.1
Implementation Version Name	DIGITEC V5.1

6.2 AE SPECIFICATIONS

6.2.1 MSI AE SPECIFICATION

MSI provides standard conformance to DICOM Interchange Option of the of the Media Storage Service Class. The Application Profiles and roles are listed in Table 5.2-1.

TABLE 6.2-1
APPLICATION PROFILES, ACTIVITIES AND ROLES FOR MSI

APPLICATION PROFILES SUPPORTED	REAL WORLD ACTIVITY	ROLE	SC OPTION
AUG-GEN-CD	Create CD	FSC	Interchange

STD-GEN-DVD	Create DVD	FSC	Interchange

6.2.1.1 File Meta Information for the MSI AE

The Source AET is set by the user in the DICOM Setup dialog.

6.2.1.2 Real-World Activities

6.2.1.2.1 Real-World Activity: "Create CD/DVD"

MSI acts as an FSC using the Interchange Option when requested to create a new CD/DVD.

MSI uses all the SOP Instances of the selected study to build a file-set to be written to the media. A corresponding DICOMDIR is created and the file set is written to an empty CD-R/DVD.

6.2.1.2.1.1 Media Storage Application Profile

The Application Profiles used by MSI for "Create CD/DVD" RWA are listed in table 5.2-1. Profile AUG-GEN-CD is an extension of the standard profile STD-GEN-CD.

MSI automatically selects the Application Profile corresponding to the physical medium to be written.

6.2.1.2.1.1.1 Options

Table 5.2-2 defines IOD and Transfer Syntax used in STD-GEN-DVD profile:

TABLE 6.2-2
IOD AND TRANSFER SYNTAX FOR STD-GEN-DVD

Information Object Definition	SOP Class UID	Transfer Syntax	Transfer Syntax UID
Basic Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
X-Ray Angiographic Image	1.2.840.10008.5.1.4.1.1.12.1	Jpeg Lossless Process 14 (selection value 1)	1.2.840.10008.1.2.4.70
X-Ray Radiofluroscopic Image	1.2.840.10008.5.1.4.1.1.12.2	Jpeg Lossless Process 14 (selection value 1)	1.2.840.10008.1.2.4.70
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1

6.3 Augmented and Private Application Profiles

6.3.1 Augmented Application Profiles

MSI supports the augmented profile AUG-GEN-CD.

6.3.1.1 AUG-GEN-CD

This Application Profile is an augmentation of the STD-GEN-CD Standard Application profile defined in PS 3.11. The augmentations add support for Jpeg Lossless Process 14 Transfer Syntax for XA and XRF SOP Classes.

6.3.1.1.1 SOP Class Augmentations

The following IODs are part of the AUG-GEN-CD. There are no requirements or restrictions on SOP options for these IODs beyond those in their standard definitions.

TABLE 6.3-1
IOD AND TRANSFER SYNTAX FOR AUG-GEN-CD

INFORMATION OBJECT DEFINITION	SOP CLASS UID	TRANSFER SYNTAX	TRANSFER SYNTAX UID
Basic Directory	1.2.840.10008.1.3.10	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
Digital X-Ray Image Storage – For Presentation	1.2.840.10008.5.1.4.1.1.1.1	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1
X-Ray Angiographic Image	1.2.840.10008.5.1.4.1.1.12.1	Jpeg Lossless Process 14 (selection value 1)	1.2.840.10008.1.2.4.70
X-Ray Radiofluroscopic Image	1.2.840.10008.5.1.4.1.1.12.2	Jpeg Lossless Process 14 (selection value 1)	1.2.840.10008.1.2.4.70
X-Ray Radiation Dose SR Storage	1.2.840.10008.5.1.4.1.1.88.67	Explicit VR Little Endian Uncompressed	1.2.840.10008.1.2.1

This Application Profile does not place any further restrictions on options or extensions for any of these SOP classes. Any otherwise permissible SOP instance is acceptable for the AUG-GEN-CD profile.

6.3.1.1.2 Directory Augmentations

There are no additional directory keys, records, or options as part of this profile.

6.3.1.1.3 Other Augmentations

None.

6.3.2 PRIVATE APPLICATION PROFILES

None.

6.4 MEDIA CONFIGURATION

A number of operating parameters can be configured by the operator. The “INSIDE_SW User Manual" describes how to setup media storage parameters from the "DICOM Setup dialog".

Configurable parameters are for example:

- source AET

7 SUPPORT OF CHARACTER SETS

The following specific character set are supported and are selectable:

- ISO-IR 100 Latin 1
- ISO-IR 101 Latin 2
- ISO-IR 109 Latin 3
- ISO-IR 110 Latin 4
- ISO-IR 144 Cyrillic
- ISO-IR 127 Arab
- ISO-IR 126 Greek
- ISO-IR 138 Hebrew
- ISO-IR 148 Latin 5
- ISO-IR 192 Unicode UTF-8

8 SECURITY

INSIDE_SW does not support any specific security measures. It is assumed that INSIDE_SW is used within a secured environment.

It is assumed that a secured environment includes at a minimum:

- Firewall or router protections to ensure that only approved external hosts have network access to INSIDE_SW.
- Firewall or router protections to ensure that INSIDE_SW only has network access to approved external hosts and services.
- Any communication with external hosts and services outside the locally secured environment use appropriate secure network channels (e.g. such as a Virtual Private Network (VPN))

Other network security procedures such as automated intrusion detection may be appropriate in some environments. Additional security features may be established by the local security policy and are beyond the scope of this conformance statement.

9 ANNEXES

9.1 IOD CONTENTS

9.1.1 CREATED SOP INSTANCE(S)

Tables 9.1-1 to 9.1-5 specify the attributes of CR/DX/XA/XRF Image and X-Ray Radiation Dose SR IODs transmitted by the NDI storage AE or written by the MSI media storage creation AE.

TABLE 9.1-1
IOD OF CREATED "CR IMAGE" INSTANCES

MODULE	REFERENCE	PRESENCE OF MODULE
Patient	Table 9.1-8	ALWAYS
General Study	Table 9.1-9	ALWAYS
Patient Study	Table 9.1-10	ALWAYS
General Series	Table 9.1-11	ALWAYS
CR Series	Table 9.1-12	ALWAYS
General Equipment	Table 9.1-23	ALWAYS
General Image	Table 9.1-15	ALWAYS
Image Pixel	Table 9.1-16	ALWAYS
Contrast/bolus	Table 9.1-25	ALWAYS
X-Ray Collimator	Table 9.1-28	ALWAYS
CR Image	Table 9.1-17	ALWAYS
X-Ray Acquisition Dose	Table 9.1-34	MNAP
X-Ray Filtration	Table 9.1-36	ALWAYS
X-Ray Grid	Table 9.1-37	ALWAYS
VOI LUT	Table 9.1-38	ALWAYS
Imaging Service Request	Table 9.1-40	MNAP
SOP Common	Table 9.1-7	ALWAYS
Any other Module of this IOD	(never present in current implementation)	

TABLE 9.1-2
IOD OF CREATED "DIGITAL X-RAY IMAGE" INSTANCES

MODULE	REFERENCE	PRESENCE OF MODULE
Patient	Table 9.1-8	ALWAYS
General Study	Table 9.1-9	ALWAYS
Patient Study	Table 9.1-10	ALWAYS
General Series	Table 9.1-11	ALWAYS
DX Series	Table 9.1-13	ALWAYS
General Equipment	Table 9.1-23	ALWAYS
General Image	Table 9.1-15	ALWAYS
Image Pixel	Table 9.1-16	ALWAYS
Contrast/Bolus	Table 9.1-25	ALWAYS
DX Anatomy Imaged	Table 9.1-18	ALWAYS
DX Image	Table 9.1-19	ALWAYS

DX Detector	Table 9.1-26	ALWAYS
X-Ray Collimator	Table 9.1-28	ALWAYS
DX Positioning	Table 9.1-29	ALWAYS
X-Ray Tomo Acquisition	Table 9.1-32	MNAP
X-Ray Acquisition Dose	Table 9.1-34	MNAP
X-Ray Generation	Table 9.1-35	MNAP
X-Ray Filtration	Table 9.1-36	ALWAYS
X-Ray Grid	Table 9.1-37	ALWAYS
VOI LUT	Table 9.1-38	ALWAYS
Acquisition Context	Table 9.1-39	ALWAYS
Imaging Service Request	Table 9.1-40	MNAP
SOP Common	Table 9.1-7	ALWAYS
Any other Module of this IOD	(never present in current implementation)	

TABLE 9.1-3
IOD OF CREATED "XA IMAGE" INSTANCES

MODULE	REFERENCE	PRESENCE OF MODULE
Patient	Table 9.1-8	ALWAYS
General Study	Table 9.1-9	ALWAYS
Patient Study	Table 9.1-10	ALWAYS
General Series	Table 9.1-11	ALWAYS
General Equipment	Table 9.1-23	ALWAYS
General Image	Table 9.1-15	ALWAYS
Image Pixel	Table 9.1-16	ALWAYS
Contrast/bolus	Table 9.1-25	ALWAYS
Cine	Table 9.1-21	ALWAYS
Multi-Frame	Table 9.1-22	ALWAYS
X-Ray Image	Table 9.1-20	ALWAYS
X-Ray Acquisition	Table 9.1-33	ALWAYS
X-Ray Collimator	Table 9.1-28	ALWAYS
X-Ray Table	Table 9.1-27	MNAP
XA Positioner	Table 9.1-30	ALWAYS
DX Detector	Table 9.1-26	ALWAYS
X-Ray Filtration	Table 9.1-36	ALWAYS
X-Ray Grid	Table 9.1-37	ALWAYS
VOI LUT	Table 9.1-38	ALWAYS
Imaging Service Request	Table 9.1-40	MNAP
SOP Common	Table 9.1-7	ALWAYS
Any other Module of this IOD	(never present in current implementation)	

TABLE 9.1-4
IOD OF CREATED "XRF IMAGE" INSTANCES

MODULE	REFERENCE	PRESENCE OF MODULE
Patient	Table 9.1-8	ALWAYS
General Study	Table 9.1-9	ALWAYS

Patient Study	Table 9.1-10	ALWAYS
General Series	Table 9.1-11	ALWAYS
General Equipment	Table 9.1-23	ALWAYS
General Image	Table 9.1-15	ALWAYS
Image Pixel	Table 9.1-16	ALWAYS
Contrast/bolus	Table 9.1-25	ALWAYS
Cine	Table 9.1-21	ALWAYS
Multi-Frame	Table 9.1-22	ALWAYS
X-Ray Image	Table 9.1-20	ALWAYS
X-Ray Acquisition	Table 9.1-33	ALWAYS
X-Ray Collimator	Table 9.1-28	ALWAYS
X-Ray Table	Table 9.1-27	MNAP
XRF Positioner	Table 9.1-31	ALWAYS
X-Ray Tomo Acquisition	Table 9.1-32	MNAP
DX Detector	Table 9.1-26	ALWAYS
X-Ray Filtration	Table 9.1-36	ALWAYS
X-Ray Grid	Table 9.1-37	ALWAYS
VOI LUT	Table 9.1-38	ALWAYS
Imaging Service Request	Table 9.1-40	MNAP
SOP Common	Table 9.1-7	ALWAYS
Any other Module of this IOD	(never present in current implementation)	

TABLE 9.1-5
IOD OF CREATED "X-RAY RADIATION DOSE SR" INSTANCES

MODULE	REFERENCE	PRESENCE OF MODULE
SOP Common	Table 9.1-7	ALWAYS
Patient	Table 9.1-8	ALWAYS
General Study	Table 9.1-9	ALWAYS
Patient Study	Table 9.1-10	ALWAYS
SR Document Series	Table 9.1-14	ALWAYS
General Equipment	Table 9.1-23	ALWAYS
Enhanced General Equipment	Table 9.1-24	ALWAYS
SR Document General	Table 9.1-41	ALWAYS
SR Document Content	Table 9.1-42	ALWAYS

In the following tables, some groups of attributes are defined as macro. Macro are expanded as defined in DICOM Standard PS3.3-2015a. Some macro are detailed in the current document too, with the purpose to specify the presence of the items in the IOD generated. The syntaxes of the macro used are (possibly nested):

MACRO NAME	SHORT NAME	PARAMETERS

SOP Instance Reference Macro	SOPMc (DICOM Standard PS3.3-2015a Table 10-11)	(SOPClassUID, SOPInstanceUID)
Image SOP Instance Reference Macro	ImgSOPMc (DICOM Standard PS3.3-2015a Table 10-3)	(*SOPMc,* ReferencedFrameNumber)
Hierarchical SOP Instance Reference Macro	HrcSOPMc (DICOM Standard PS3.3-2015a Table C.17-3)	(StudyUID,SeriesUID,*SOPMc*-SOPInstanceReference)
Code Sequence Macro	CdMc (DICOM Standard PS3.3-2015a Table 9.8-1)	(CodeValue, CodeMeaning, CodingSchemeDesignator , CodeSchemeVersion)
Person Identification Macro	PIdMc (DICOM Standard PS3.3-2015a Table 10-1)	(*CdMc*-PersonID, PersonAddr, PersonTelNum, *CdMc*-Institution, InstitutionName, InstitutionAddr)
Image Pixel Macro Attribute	ImgPxMc	See Table 9.1-6

TABLE 9.1-6
IMAGE PIXEL MACRO ATTRIBUTES

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Samples per Pixel	(0028,0002)	US	"1"	ALWAYS	FIX
Photometric Interpretation	(0028,0004)	CS	"MONOCHROME2" (AUTO for DX IOD)	ALWAYS	FIX/AUTO
Rows	(0028,0010)	US		ALWAYS	AUTO
Columns	(0028,0011)	US		ALWAYS	AUTO
Pixel Aspect Ratio	(0028,0034)	IS	"1\1"	ALWAYS	FIX
Bits Allocated	(0028,0100)	US		ALWAYS	CONFIG
Bits Stored	(0028,0101)	US		ALWAYS	CONFIG
High Bit	(0028,0102)	US		ALWAYS	CONFIG
Pixel Representation	(0028,0103)	US	"0"	ALWAYS	FIX
Smallest Image Pixel Value	(0028,0106)	US	(never present in current implementation)		
Largest Image Pixel Value	(0028,0107)	US	(never present in current implementation)		
Pixel Data	(7FE0,0010)	OB/OW		ALWAYS	AUTO
Any other Attribute of this Module			(never present in current implementation)		

The following tables list the attributes specific to every module included in the IODs of the instances created by network and media application entities.

TABLE 9.1-7
SOP COMMON MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE

Specific Character Set	(0008,0005)	CS		ANAP	CONFIG
SOP Class UID	(0008,0016)	UI		ALWAYS	AUTO
SOP Instance UID	(0008,0018)	UI		ALWAYS	AUTO
Instance Creator UID	(0008,0014)	UI	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-8
PATIENT MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Patient's Name	(0010,0010)	PN		VNAP	MWL/ USER
Patient ID	(0010,0020)	LO		VNAP	MWL/ USER
Patient's Birth Date	(0010,0030)	DA		VNAP	MWL/ USER
Patient's Sex	(0010,0040)	CS		VNAP	MWL/ USER
Other Patient IDs	(0010,1000)	LO	(never present in current implementation)		
Other Patient Names	(0010,1001)	PN	(never present in current implementation)		
Ethnic Group	(0010,2160)	SH	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-9
GENERAL STUDY MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Study Date	(0008,0020)	DA		VNAP	AUTO
Study Time	(0008,0030)	TM		VNAP	AUTO
Accession Number	(0008,0050)	SH		VNAP	MWL/ USER
Referring Physician's Name	(0008,0090)	PN		VNAP	MWL/ USER
Referring Physician Identification Sequence	(0008,0096)	SQ	*PIdMc* (never present in current implementation)		
Study Description	(0008,1030)	LO		ANAP	MWL/ USER
Procedure Code Sequence	(0008,1032)	SQ	*CdMc*	ANAP	MWL
Physician(s) of Records	(0008,1048)	PN	(never present in current implementation)		
Physician(s) of Records Identification Sequence	(0008,1049)	SQ	*PIdMc* (never present in current implementation)		

Name of Physician(s) Reading Study	(0008,1060)	PN	(never present in current implementation)		
Name of Physician(s) Reading Study Identification Sequence	(0008,1062)	SQ	*PIdMc* (never present in current implementation)		
Referenced Study Sequence	(0008,1110)	SQ	*SOPMc*	ANAP	MWL
Study Instance UID	(0020,000D)	UI		ALWAYS	MWL/ AUTO
Study ID	(0020,0010)	SH		VNAP	MWL/ USER
Requesting Service Code Sequence	(0032,1034)	SQ	*CdMc* (never present in current implementation)		
Reason for Performed Procedure Code Sequence	(0040,1012)	SQ	*CdMc* (never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-10
PATIENT STUDY MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Patient's Age	(0010,1010)	AS		ANAP	MWL/ USER
Patient's Size	(0010,1020)	DS		ANAP	MWL/ USER
Patient's Size Code Sequence	(0010,1021)	SQ	*CdMc*	ANAP	MWL/ USER
Patient's Weight	(0010,1030)	DS		ANAP	MWL/ USER
Occupation	(0010,2180)	SH	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-11
GENERAL SERIES MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Series Date	(0008,0021)	DA		VNAP	AUTO
Series Time	(0008,0031)	TM		VNAP	AUTO
Modality	(0008,0060)	CS	Respect. "CR", "DX", "XA", "RF", "SR"	ALWAYS	FIX
Series Description	(0008,103E)	LO		VNAP	AUTO
Series Description Code Sequence	(0008,103F)	SQ	*CdMc* (never present in current implementation)		
Performing Physicians' Name	(0008,1050)	PN	(never present in current implementation)		
Performing Physician Identification Sequence	(0008,1052)	SQ	*PIdMc* (never present in current implementation)		

Operators' Name	(0008,1070)	PN	(never present in current implementation)		
Operator Identification Sequence	(0008,1072)	SQ	*PIdMc* (never present in current implementation)		
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	*SOPMc*	ANAP	AUTO
Body Part Examined	(0018,0015)	CS		VNAP	MWL/ USER
Protocol Name	(0018,1030)	LO		ANAP	MWL/ USER
Patient Position	(0018,5100)	CS	(never present in current implementation)		
View Position	(0018,5101)	CS		VNAP	MWL/ USER
Series Instance UID	(0020,000E)	UI		ALWAYS	AUTO
Series Number	(0020,0011)	IS		VNAP	AUTO
Laterality	(0020,0060)	CS	Absent in DX IOD	VNAP	AUTO/ USER
Performed Procedure Step Start Date	(0040,0244)	DA	3	ANAP	AUTO
Performed Procedure Step Start Time	(0040,0245)	TM	3	ANAP	AUTO
Performed Procedure Step ID	(0040,0253)	SH	3	ANAP	MWL/ USER
Performed Procedure Step Description	(0040,0254)	LO	3	ANAP	MWL/ USER
Performed Protocol Code Sequence	(0040,0260)	SQ	*CdMc* 3	ANAP	MWL/ USER
Request Attribute Sequence	(0040,0275)	SQ	3	ANAP	AUTO
> Requested Procedure Description	(0032,1060)	LO		VNAP	MWL/ USER
> Requested Procedure Code Sequence	(0032,1064)	SQ	*CdMc* (never present in current implementation)		
> Scheduled Procedure Step Description	(0040,0007)	LO		VNAP	MWL/ USER
> Scheduled Protocol Code Sequence	(0040,0008)	SQ	*CdMc*	VNAP	MWL/ USER
> Scheduled Procedure Step ID	(0040,0009)	SH		VNAP	MWL/ USER
> Requested Procedure ID	(0040,1001)	SH		VNAP	MWL/ USER
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-12
CR SERIES MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE

Body Part Examined	(0018,0015)	CS		VNAP	MWL/ USER
Filter Type	(0018,1160)	SH		VNAP	AUTO
Collimator/grid Name	(0018,1180)	SH	(never present in current implementation)		
Focal Spot	(0018,1190)	DS	(never present in current implementation)		
Plate Type	(0018,1260)	SH	(never present in current implementation)		
Phosphor Type	(0018,1261)	LO	(never present in current implementation)		
View Position	(0018,5101)	CS		VNAP	MWL/ USER
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-13
DX SERIES MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Modality	(0008,0060)	CS	"DX"	ALWAYS	FIX
Presentation Intent Type	(0008,0068)	CS	"FOR PRESENTATION"	ALWAYS	FIX
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	*SOPMc*	ANAP	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-14
SR DOCUMENT SERIES MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Series Date	(0008,0021)	DA		ANAP	AUTO
Series Time	(0008,0031)	TM		ANAP	AUTO
Modality	(0008,0060)	CS	"SR"	ALWAYS	FIX
Series Description	(0008,103E)	LO		EMPTY	
Series Description Code Sequence	(0008,103F)	SQ	*CdMc* (never present in current implementation)		
Referenced Performed Procedure Step Sequence	(0008,1111)	SQ	*SOPMc*	EMPTY	
Series Instance UID	(0020,000E)	UI		ALWAYS	AUTO
Series Number	(0020,0011)	IS		ALWAYS	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-15
GENERAL IMAGE MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Image Type	(0008,0008)	CS	"DERIVED\PRIMARY"	ALWAYS	FIX
Acquisition Date	(0008,0022)	DA		VNAP	AUTO
Content Date	(0008,0023)	DA		VNAP	AUTO
Acquisition DateTime	(0008,002A)	DT	(never present in current implementation)		
Acquisition Time	(0008,0032)	TM		VNAP	AUTO
Content Time	(0008,0033)	TM		VNAP	AUTO
Referenced Image Sequence	(0008,1140)	SQ	*ImgSOPMc* (never present in current implementation)		
>Purpose of Reference Code Sequence	(0040,A170)	SQ	*CdMc-CID 7201* (never present in current implementation)		
Referenced Instance Sequence	(0008,114A)	SQ	(never present in current implementation)		
Derivation Description	(0008,2111)	ST	(never present in current implementation)		
Source Image Sequence	(0008,2112)	SQ	*ImgSOPMc*	ANAP	AUTO
>Purpose of Reference Code Sequence	(0040,A170)	SQ	*CdMc-CID 7202* (never present in current implementation)		
>Patient Orientation	(0020,0020)	CS	(never present in current implementation)		
>Spatial Locations Preserved	(0028,135A)	CS	(never present in current implementation)		
Irradiation Event UID	(0008,3010)	UI		ANAP	AUTO
Derivation Code Sequence	(0008,9215)	SQ	*CdMc-CID 7203* (never present in current implementation)		
Acquisition Number	(0020,0012)	IS	(never present in current implementation)		
Instance Number	(0020,0013)	IS		VNAP	AUTO
Patient Orientation	(0020,0020)	CS		EMPTY	
Images in Acquisition	(0020,1002)	IS	(never present in current implementation)		
Image Comments	(0020,4000)	LT		ANAP	AUTO
Quality Control Image	(0028,0300)	CS	(never present in current implementation)		
Burned In Annotation	(0028,0301)	CS		ALWAYS	CONFIG
Recognizable Visual Features	(0028,0302)	CS	(never present in current implementation)		
Lossy Image Compression	(0028,2110)	CS	"00"	ALWAYS	FIX
Lossy Image Compression Ratio	(0028,2112)	DS	(never present in current implementation)		
Lossy Image Compression Method	(0028,2114)	CS	(never present in current implementation)		
Icon Image Sequence	(0088,0200)	SQ	*ImgPxMc* (never present in current implementation)		
Presentation LUT Shape	(2050,0020)	CS	(never present in CR/XA/XRF IODs)	ALWAYS	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-16
IMAGE PIXEL MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Include 'Image Pixel Macro'			See Table 9.1-6		
Pixel Padding Range Limit	(0028,0121)	US	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-17
CR IMAGE MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
KVP	(0018,0060)	DS		ANAP	AUTO
Plate ID	(0018,1004)	LO	(never present in current implementation)		
Distance Source to Detector	(0018,1110)	DS		VNAP	AUTO
Distance Source to Patient	(0018,1111)	DS	(never present in current implementation)		
Exposure Time	(0018,1150)	IS		VNAP	AUTO
X-Ray Tube Current	(0018,1151)	IS		VNAP	AUTO
Exposure	(0018,1152)	IS		ANAP	AUTO
Exposure in µAs	(0018,1153)	IS		ANAP	AUTO
Imager Pixel Spacing	(0018,1164)	DS		ALWAYS	AUTO
Sensitivity	(0018,6000)	DS		VNAP	AUTO
Photometric Interpretation	(0028,0004)	CS	"MONOCHROME2"	ALWAYS	FIX
Pixel Spacing	(0028,0030)	DS		ANAP	AUTO
Pixel Spacing Calibration Type	(0028,0A02)	CS	(never present in current implementation)		
Pixel Spacing Calibration Description	(0028,0A04)	LO	(never present in current implementation)		
Calibration Image	(0050,0004)	CS	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-18
DX ANATOMY IMAGED MODULE

Attribute Name	Tag	VR	Value	Presence of Value	Source
Anatomic Region Sequence	(0008,2218)	SQ	*CdMc-DCID 4031*	EMPTY	
>Anatomic Region Modifier Sequence	(0008,2220)	SQ	*CdMC-DCID 2* (never present in current implementation)		
Image Laterality	(0020,0062)	CS		ALWAYS	AUTO

Any other Attribute of this Module	(never present in current implementation)		

TABLE 9.1-19
DX IMAGE MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Image Type	(0008,0008)	CS	"DERIVED\PRIMARY"	ALWAYS	FIX
Derivation Description	(0008,2111)	ST	(never present in current implementation)		
Patient Orientation	(0020,0020)	CS		EMPTY	
Samples per Pixel	(0028,0002)	US	1	ALWAYS	FIX
Photometric Interpretation	(0028,0004)	CS		ALWAYS	AUTO
Bits Allocated	(0028,0100)	US		ALWAYS	CONFIG
Bits Stored	(0028,0101)	US		ALWAYS	CONFIG
High Bit	(0028,0102)	US		ALWAYS	CONFIG
Pixel Representation	(0028,0103)	US	0	ALWAYS	FIX
Burned In Annotation	(0028,0301)	CS		ALWAYS	CONFIG
Pixel Intensity Relationship	(0028,1040)	CS	"LIN"	ALWAYS	FIX
Pixel Intensity Relationship Sign	(0028,1041)	SS	-1	ALWAYS	FIX
Window Center	(0028,1050)	DS		ANAP	CONFIG
Window Width	(0028,1051)	DS		ANAP	CONFIG
Rescale Intercept	(0028,1052)	DS	"0"	ALWAYS	FIX
Rescale Slope	(0028,1053)	DS	"1"	ALWAYS	FIX
Rescale Type	(0028,1054)	LO	"US"	ALWAYS	FIX
Window Center & Width Explanation	(0028,1055)	LO	(never present in current implementation)		
Lossy Image Compression	(0028,2110)	CS	"00"	ALWAYS	FIX
Lossy Image Compression Ratio	(0028,2112)	DS	(never present in current implementation)		
VOI LUT Sequence	(0028,3010)	SQ		ANAP	AUTO
>LUT Descriptor	(0028,3002)	US		ALWAYS	AUTO
>LUT Explanation	(0028,3003)	LO	(never present in current implementation)		
>LUT Data	(0028,3006)	US/ OW		ALWAYS	AUTO
Calibration Image	(0050,0004)	CS	(never present in current implementation)		
Presentation LUT Shape	(2050,0020)	CS		ALWAYS	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-20
X-RAY IMAGE MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Image Type	(0008,0008)	CS	"DERIVED\PRIMARY"	ALWAYS	FIX
Referenced Image Sequence	(0008,1140)	SQ	*ImgSOPMc* (never present in current implementation)		
>Purpose of Reference Code Sequence	(0040,A170)	SQ	*CdMc-CID 7201* (never present in current implementation)		
Derivation Description	(0008,2111)	ST	(never present in current implementation)		
Anatomic Region Sequence	(0008,2218)	SQ	*CdMc-DCID 4031*(never present in current implementation)		
>Anatomic Region Modifier Sequence	(0008,2220)	SQ	*CdMC-DCID 2* (never present in current implementation)		
Scan Options	(0018,0022)	CS	(never present in current implementation)		
Acquisition Device Processing Description	(0018,1400)	LO	(never present in current implementation)		
Frame Label Vector	(0018,2002)	SH	(never present in current implementation)		
Samples per Pixel	(0028,0002)	US	1	ALWAYS	FIX
Photometric Interpretation	(0028,0004)	CS	"MONOCHROME2"	ALWAYS	FIX
Frame Increment Pointer	(0028,0009)	AT	(0018,1065)	ALWAYS	FIX
Frame Dimension Pointer	(0028,000A)	AT	(never present in current implementation)		
Bits Allocated	(0028,0100)	US		ALWAYS	CONFIG
Bits Stored	(0028,0101)	US		ALWAYS	CONFIG
High Bit	(0028,0102)	US		ALWAYS	CONFIG
Pixel Representation	(0028,0103)	US	0	ALWAYS	FIX
Pixel Intensity Relationship	(0028,1040)	CS	"LIN"	ALWAYS	FIX
Lossy Image Compression	(0028,2110)	CS	"00"	ALWAYS	FIX
R Wave Pointer	(0028,6040)	US	(never present in current implementation)		
Calibration Image	(0050,0004)	CS	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-21
CINE MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Start Trim	(0008,2142)	IS	(never present in current implementation)		
Stop Trim	(0008,2143)	IS	(never present in current implementation)		
Recommended Display Frame Rate	(0008,2144)	IS	(never present in current implementation)		

Cine Rate	(0018,0040)	IS	(never present in current implementation)		
Frame Time	(0018,1063)	DS	(never present in current implementation)		
Frame Time Vector	(0018,1065)	DS		ALWAYS	AUTO
Preferred Playback Sequencing	(0018,1244)	US	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-22
MULTI-FRAME MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Number of Frames	(0028,0008)	IS		ALWAYS	AUTO
Frame Increment Pointer	(0028,0009)	AT	(0018,1065)	ALWAYS	FIX
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-23
GENERAL EQUIPMENT MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Manufacturer	(0008,0070)	LO	Default: "Digitec"	VNAP	CONFIG
Institution Name	(0008,0080)	LO		VNAP	CONFIG
Institution Address	(0008,0081)	LO	(never present in current implementation)		
Station Name	(0008,1010)	LO		ANAP	CONFIG
Institutional Department Name	(0008,1040)	LO	(never present in current implementation)		
Manufacturer's Model Name	(0008,1090)	LO	Default: "Inside"	VNAP	CONFIG
Device Serial Number	(0018,1000)	LO	Default: auto detected	ALWAYS	CONFIG/ AUTO
Gantry ID	(0018,1008)	LO	(never present in current implementation)		
Software Version	(0018,1020)	LO		ALWAYS	AUTO
Spatial Resolution	(0018,1050)	LO	(never present in current implementation)		
Date of Last Calibration	(0018,1200)	LO	(never present in current implementation)		
Time of Last Calibration	(0018,1201)	LO	(never present in current implementation)		
Pixel Padding Value	(0028,0120)	US	(never present in current implementation)		

Any other Attribute of this Module	(never present in current implementation)		

TABLE 9.1-24
ENHANCED GENERAL EQUIPMENT MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Manufacturer	(0008,0070)	LO	Default: "Digitec"	ALWAYS	CONFIG
Manufacturer's Model Name	(0008,1090)	LO	Default: "Inside"	ALWAYS	CONFIG
Device Serial Number	(0018,1000)	LO	Default: auto detected	ALWAYS	CONFIG
Software Version	(0018,1020)	LO		ALWAYS	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-25
CONTRAST/BOLUS MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Contrast/Bolus Agent	(0018,0010)	LO		EMPTY	
Contrast/Bolus Agent Sequence	(0018,0012)	SQ	*CdMc-BCID 12* (never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-26
DX DETECTOR MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Field of View Shape	(0018,1147)	CS	"RECTANGLE"	ANAP	FIX
Field of View Dimension(s)	(0018,1149)	IS		ANAP	AUTO
Imager Pixel Spacing	(0018,1164)	DS		ALWAYS	AUTO
Exposure Index	(0018,1411)	DS	(never present in XA/XRF IODs)	ANAP	AUTO
Target Exposure Index	(0018,1412)	DS	(never present in XA/XRF IODs)	ANAP	AUTO
Deviation Index	(0018,1413)	DS	(never present in XA/XRF IODs)	ANAP	AUTO
Sensitivity	(0018,6000)	DS	(never present in XA/XRF IODs)	VNAP	AUTO
Detector Temperature	(0018,7001)	DS	(never present in current implementation)		
Detector Type	(0018,7004)	CS	"SCINTILLATOR"	ALWAYS	FIX
Detector Configuration	(0018,7005)	CS	"AREA"	ALWAYS	FIX
Detector Description	(0018,7006)	LT	(never present in current implementation)		
Detector Mode	(0018,7008)	LT	(never present in current implementation)		
Detector ID	(0018,700A)	SH	(never present in current implementation)		

Date of Last Detector Calibration	(0018,700C)	DA	(never present in current implementation)		
Time of Last Detector Calibration	(0018,700E)	TM	(never present in current implementation)		
Exposures on Detector Since Last Calibration	(0018,7010)	IS	(never present in current implementation)		
Exposures on Detector Since Manufactured	(0018,7011)	IS	(never present in current implementation)		
Detector Time Since Last Exposure	(0018,7012)	DS	(never present in current implementation)		
Detector Binning	(0018,701A)	DS		ALWAYS	AUTO
Detector Element Physical Size	(0018,7020)	DS	(never present in current implementation)		
Detector Element Spacing	(0018,7022)	DS	(never present in current implementation)		
Detector Active Shape	(0018,7024)	CS	(never present in current implementation)		
Detector Active Dimension(s)	(0018,7026)	DS	(never present in current implementation)		
Detector Active Origin	(0018,7028)	DS	(never present in current implementation)		
Detector Manufacturer Name	(0018,702A)	LO	(never present in current implementation)		
Detector Manufacturer's Model Name	(0018,702B)	LO	(never present in current implementation)		
Field of View Origin	(0018,7030)	DS	(never present in current implementation)		
Field of View Rotation	(0018,7032)	DS	(never present in current implementation)		
Field of View Horizontal Flip	(0018,7034)	CS	(never present in current implementation)		
Pixel Spacing	(0028,0030)	DS		ANAP	AUTO
Pixel Spacing Calibration Type	(0028,0A02)	CS	(never present in current implementation)		
Pixel Spacing Calibration Description	(0028,0A04)	LO	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-27
X-RAY TABLE MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Table Motion	(0018,1134)	CS	(never present in current implementation)		
Table Vertical Increment	(0018,1135)	DS	(never present in current implementation)		
Table Lateral Increment	(0018,1136)	DS	(never present in current implementation)		

Table Longitudinal Increment	(0018,1137)	DS	(never present in current implementation)		
Table Angle	(0018,1138)	DS	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-28
X-RAY COLLIMATOR MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Collimator Shape	(0018,1700)	CS	"RECTANGULAR"	ANAP	FIX
Collimator Left Vertical Edge	(0018,1702)	IS		ANAP	AUTO
Collimator Right Vertical Edge	(0018,1704)	IS		ANAP	AUTO
Collimator Upper Horizontal Edge	(0018,1706)	IS		ANAP	AUTO
Collimator Lower Horizontal Edge	(0018,1708)	IS		ANAP	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-29
DX POSITIONING MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Distance Source to Detector	(0018,1110)	DS		VNAP	AUTO
Distance Source to Patient	(0018,1111)	DS	(never present in current implementation)		
Estimated Radiographic Magnification Factor	(0018,1114)	DS	(never present in current implementation)		
Table Angle	(0018,1138)	DS	(never present in current implementation)		
Table Type	(0018,113A)	CS	(never present in current implementation)		
Body Part Thickness	(0018,11A0)	DS	(never present in current implementation)		
Compression Force	(0018,11A2)	DS	(never present in current implementation)		
Column Angulation	(0018,1450)	DS	(never present in current implementation)		
Positioner Type	(0018,1508)	CS		EMPTY	
Positioner Primary Angle	(0018,1510)	DS	(never present in current implementation)		
Positioner Secondary Angle	(0018,1511)	DS	(never present in current implementation)		
Detector Primary Angle	(0018,1530)	DS	(never present in current implementation)		

Detector Secondary Angle	(0018,1531)	DS	(never present in current implementation)		
Patient Position	(0018,5100)	CS	(never present in current implementation)		
View Position	(0018,5101)	CS		VNAP	MWL/ USER
Projection Eponymous Name Code Sequence	(0018,5104)	SQ	*CdMc-BCID 4012* (never present in current implementation)		
View Code Sequence	(0054,0220)	SQ	*CdMc-BCID 4010* (never present in current implementation)		
>View Modifier Code Sequence	(0054,0222)	SQ	*CdMc-BCID 4011* (never present in current implementation)		
Patient Orientation Code Sequence	(0054,0410)	SQ	*CdMc-BCID 19* (never present in current implementation)		
>Patient Orientation Modifier Code Sequence	(0054,0412)	SQ	*CdMc-BCID 20* (never present in current implementation)		
Patient Gantry Relationship Code Sequence	(0054,0414)	SQ	*CdMc-BCID 21* (never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-30
XA POSITIONER MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Distance Source to Detector	(0018,1110)	DS		VNAP	AUTO
Distance Source to Patient	(0018,1111)	DS	(never present in current implementation)		
Estimated Radiographic Magnification Factor	(0018,1114)	DS	(never present in current implementation)		
Positioner Motion	(0018,1500)	CS		EMPTY	
Positioner Primary Angle	(0018,1510)	DS		EMPTY	
Positioner Secondary Angle	(0018,1511)	DS		EMPTY	
Positioner Primary Angle Increment	(0018,1520)	DS		EMPTY	
Positioner Secondary Angle Increment	(0018,1521)	DS		EMPTY	
Detector Primary Angle	(0018,1530)	DS	(never present in current implementation)		
Detector Secondary Angle	(0018,1531)	DS	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-31
XRF POSITIONER MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE

Distance Source to Detector	(0018,1110)	DS		VNAP	AUTO
Distance Source to Patient	(0018,1111)	DS	(never present in current implementation)		
Estimated Radiographic Magnification Factor	(0018,1114)	DS	(never present in current implementation)		
Column Angulation	(0018,1450)	DS	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-32
X-RAY TOMOGRAPHY ACQUISITION MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Tomo Layer Height	(0018,1460)	DS		ANAP	AUTO
Tomo Angle	(0018,1470)	DS		ANAP	AUTO
Tomo Time	(0018,1480)	DS		ANAP	AUTO
Tomo Type	(0018,1490)	CS		ANAP	AUTO
Tomo Class	(0018,1491)	CS		ANAP	AUTO
Number of Tomosynthesis Source Images	(0018,1495)	IS		ANAP	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-33
X-RAY ACQUISITION MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
KVP	(0018,0060)	DS		VNAP	AUTO
Field of View Shape	(0018,1147)	CS	"RECTANGLE"	ANAP	FIX
Field of View Dimension(s)	(0018,1149)	IS		ANAP	AUTO
Exposure Time	(0018,1150)	IS		VNAP	AUTO
X-Ray Tube Current	(0018,1151)	IS		VNAP	AUTO
Exposure	(0018,1152)	IS		ANAP	AUTO
Exposure in μAs	(0018,1153)	IS		ANAP	AUTO
Average Pulse Width	(0018,1154)	DS	(never present in current implementation)		
Radiation Setting	(0018,1155)	CS		ALWAYS	AUTO
Radiation Mode	(0018,115A)	CS		ANAP	AUTO
Image and Fluoroscopy Area Dose Product	(0018,115E)	DS		ANAP	AUTO
Type of Filters	(0018,1161)	LO		VNAP	AUTO
Intensifier Size	(0018,1162)	DS	(never present in current implementation)		
Imager Pixel Spacing	(0018,1164)	DS		ALWAYS	AUTO
Grid	(0018,1166)	CS	(never present in current implementation)		
Focal Spot	(0018,1190)	DS	(never present in current implementation)		

Exposure Time in µS	(0018,8150)	DS		ANAP	AUTO
X-Ray Tube Current in µA	(0018,8151)	DS		ANAP	AUTO
Pixel Spacing	(0028,0030)	DS		ANAP	AUTO
Pixel Spacing Calibration Type	(0028,0A02)	CS	(never present in current implementation)		
Pixel Spacing Calibration Description	(0028,0A04)	LO	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-34
X-RAY ACQUISITION DOSE MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
KVP	(0018,0060)	DS		ANAP	AUTO
Distance Source to Detector	(0018,1110)	DS		VNAP	AUTO
Distance Source to Patient	(0018,1111)	DS	(never present in current implementation)		
Exposure Time	(0018,1150)	IS		VNAP	AUTO
X-Ray Tube Current	(0018,1151)	IS		VNAP	AUTO
Exposure	(0018,1152)	IS		ANAP	AUTO
Exposure in µAs	(0018,1153)	IS		ANAP	AUTO
Rectification Type	(0018,1156)	CS	(never present in current implementation)		
Image and Fluoroscopy Area Dose Product	(0018,115E)	DS		ANAP	AUTO
Filter Type	(0018,1160)	SH		VNAP	AUTO
Anode Target Material	(0018,1191)	CS	(never present in current implementation)		
Body Part Thickness	(0018,11A0)	DS	(never present in current implementation)		
Relative X-Ray Exposure	(0018,1405)	IS		VNAP	AUTO
Exposure Index	(0018,1411)	DS		ANAP	AUTO
Target Exposure Index	(0018,1412)	DS		ANAP	AUTO
Deviation Index	(0018,1413)	DS		ANAP	AUTO
Filter Material	(0018,7050)	CS	(never present in current implementation)		
Filter Thickness Minimum	(0018,7052)	DS	(never present in current implementation)		
Filter Thickness Maximum	(0018,7054)	DS	(never present in current implementation)		
Filter Beam Path Length Minimum	(0018,7056)	FL	(never present in current implementation)		
Filter Beam Path Length Maximum	(0018,7058)	FL	(never present in current implementation)		
Exposure Time in µS	(0018,8150)	DS		ANAP	AUTO
X-Ray Tube Current in µA	(0018,8151)	DS		ANAP	AUTO

Entrance Dose	(0040,0302)	US		ANAP	AUTO
Exposed Area	(0040,0303)	US	(never present in current implementation)		
Distance Source to Entrance	(0040,0306)	DS	(never present in current implementation)		
Comments on Radiation Dose	(0040,0310)	ST	(never present in current implementation)		
X-Ray Output	(0040,0312)	DS	(never present in current implementation)		
Half Value Layer	(0040,0314)	DS	(never present in current implementation)		
Organ Dose	(0040,0316)	DS	(never present in current implementation)		
Organ Exposed	(0040,0318)	CS	(never present in current implementation)		
Entrance Dose in mGy	(0040,8302)	DS		ANAP	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-35
X-RAY GENERATION MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
KVP	(0018,0060)	DS		ANAP	AUTO
Generator ID	(0018,1005)	LO	(never present in current implementation)		
Exposure Time	(0018,1150)	IS		VNAP	AUTO
X-Ray Tube Current	(0018,1151)	IS		VNAP	AUTO
Exposure	(0018,1152)	IS		ANAP	AUTO
Exposure in µAs	(0018,1153)	IS		ANAP	AUTO
Rectification Type	(0018,1156)	CS	(never present in current implementation)		
Focal Spot	(0018,1190)	DS	(never present in current implementation)		
Anode Target Material	(0018,1191)	CS	(never present in current implementation)		
Exposure Control Mode	(0018,7060)	CS	(never present in current implementation)		
Exposure Control Mode Description	(0018,7062)	LT	(never present in current implementation)		
Exposure Status	(0018,7064)	CS	(never present in current implementation)		
Phototimer Setting	(0018,7065)	DS	(never present in current implementation)		
Exposure Time in µS	(0018,8150)	DS		ANAP	AUTO
X-Ray Tube Current in µA	(0018,8151)	DS		ANAP	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-36
X-RAY FILTRATION MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Filter Type	(0018,1160)	SH		VNAP	AUTO
Filter Material	(0018,7050)	CS		ANAP	AUTO
Filter Thickness Minimum	(0018,7052)	DS		ANAP	AUTO
Filter Thickness Maximum	(0018,7054)	DS		ANAP	AUTO
Filter Beam Path Length Minimum	(0018,7056)	FL	(never present in current implementation)		
Filter Beam Path Length Maximum	(0018,7058)	FL	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-37
X-RAY GRID MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Grid ID	(0018,1006)	LO	(never present in current implementation)		
Grid	(0018,1166)	CS		ANAP	AUTO
Grid Absorbing Material	(0018,7040)	LT	(never present in current implementation)		
Grid Spacing Material	(0018,7041)	LT	(never present in current implementation)		
Grid Thickness	(0018,7042)	DS	(never present in current implementation)		
Grid Pitch	(0018,7044)	DS	(never present in current implementation)		
Grid Aspect Ratio	(0018,7046)	IS	(never present in current implementation)		
Grid Period	(0018,7048)	DS	(never present in current implementation)		
Grid Focal Distance	(0018,704C)	DS	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-38
VOI LUT MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Window Center	(0028,1050)	DS		ANAP	CONFIG
Window Width	(0028,1051)	DS		ANAP	CONFIG
Window Center & Width Explanation	(0028,1055)	LO	(never present in current implementation)		

VOI LUT Function	(0028,1056)	CS	(never present in current implementation)		
VOI LUT Sequence	(0028,3010)	SQ	(never present in CR/XA/XRF IODs)	ANAP	AUTO
>LUT Descriptor	(0028,3002)	US	(never present in CR/XA/XRF IODs)	ALWAYS	AUTO
>LUT Explanation	(0028,3003)	LO	(never present in current implementation)		
>LUT Data	(0028,3006)	US/ OW	(never present in CR/XA/XRF IODs)	ALWAYS	AUTO
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-39
ACQUISITION CONTEXT MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Acquisition Context Sequence	(0040,0555)	SQ		EMPTY	
>Measurement Units Code Sequence	(0040,08EA)	SQ	*CdMc-BCID 82*		
>Value Type	(0040,A040)	CS			
>Concept Name Code Sequence	(0040,A043)	SQ	*CdMc*		
>Date	(0040,A121)	DA			
>Time	(0040,A122)	TM			
>Person Name	(0040,A123)	PN			
>Referenced Frame Numbers	(0040,A136)	US			
>Text Value	(0040,A160)	UT			
>Concept Code Sequence	(0040,A168)	SQ	*CdMc*		
>Numeric Value	(0040,A30A)	DS			
Acquisition Context Description	(0040,0556)	ST	(never present in current implementation)		
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-40
IMAGING SERVICE REQUEST MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Requesting Physician	(0032,1032)	PN		VNAP	MWL
Requesting Service	(0032,1033)	LO		VNAP	MWL
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-41
SR DOCUMENT GENERAL MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Content Date	(0008,0023)	DA		ALWAYS	AUTO
Content Time	(0008,0033)	TM		ALWAYS	AUTO
Referenced Instance Sequence	(0008,114A)	SQ		EMPTY	
Instance Number	(0020,0013)	IS		ALWAYS	AUTO
Verifying Observer Sequence	(0040,A073)	SQ		EMPTY	
Author Observer Sequence	(0040,A078)	SQ		EMPTY	
Participant Sequence	(0040,A07A)	SQ		EMPTY	
Custodial Organization Sequence	(0040,A07C)	SQ		EMPTY	
Predecessor Documents Sequence	(0040,A360)	SQ		EMPTY	
Referenced Request Sequence	(0040,A370)	SQ		EMPTY	
Performed Procedure Code Sequence	(0040,A372)	SQ	*CdMc*	VNAP	MWL/ USER
Current Requested Procedure Evidence Sequence	(0040,A375)	SQ	*HrcSOPMc*	VNAP	AUTO
Pertinent Other Evidence Sequence	(0040,A385)	SQ	*HrcSOPMc*	EMPTY	
Completion Flag	(0040,A491)	CS	"COMPLETE"	ALWAYS	FIX
Completion Flag Description	(0040,A492)	LO		EMPTY	
Verification Flag	(0040,A493)	CS	"UNVERIFIED"	ALWAYS	FIX
Preliminary Flag	(0040,A496)	CS	"FINAL"	ALWAYS	FIX
Identical Documents Sequence	(0040,A525)	SQ	*HrcSOPMc*	EMPTY	
Any other Attribute of this Module			(never present in current implementation)		

TABLE 9.1-42
SR DOCUMENT CONTENT MODULE

ATTRIBUTE NAME	TAG	VR	VALUE	PRESENCE OF VALUE	SOURCE
Observation Date Time	(0040,A032)	DT		ANAP	AUTO
Include Document Content Item Tree – Ref. Table 9.1-43				ALWAYS	
Any other Attribute of this Module			(never present in current implementation)		

The following table is formatted according to template specification tables reported in PS3.16-2011.

TABLE 9.1-43
X-RAY RADIATION DOSE SR DOCUMENT CONTENT ITEM TREE

NL	Rel. with Parent	VT	Concept Name	VM	Value	Presence of Value	Source
		CONTAINER	EV (113701,DCM,01,"X-Ray Radiation Dose")	1	"DCMR","10001","SEPARATE"	ALWAYS	FIX
>	HAS CONCEPT MOD	CODE	EV (121058,DCM,01, "Procedure Reported")	1	EV (113704,DCM,01,"Projection X-Ray")	ALWAYS	FIX
>>	HAS CONCEPT MOD	CODE	EV (G-C0E8,SRT,"Has Intent")	1	EV (R-408C3,SRT,"Diagnostic Intent")	ALWAYS	FIX
>	HAS OBS CONTEXT	CODE	EV (121005,DCM,01, "Observer Type")	1-n	EV (121007,DCM,01,"Device")	ALWAYS	FIX
>	HAS OBS CONTEXT	UIDREF	EV (121012,DCM,01,"Device Observer UID")			ALWAYS	AUTO/ CONFIG
>	HAS OBS CONTEXT	TEXT	EV (121013,DCM,01,"Device Observer Name ")			ANAP	CONFIG
>	HAS OBS CONTEXT	TEXT	EV (121014,DCM,01,"Device Observer Manufacturer")			ANAP	AUTO/ CONFIG
>	HAS OBS CONTEXT	TEXT	EV (121015,DCM,01,"Device Observer Model Name ")			ANAP	AUTO/ CONFIG
>	HAS OBS CONTEXT	TEXT	EV (121016,DCM,01,"Device Observer Serial Number ")			ANAP	AUTO/ CONFIG
>	HAS OBS CONTEXT	TEXT	EV (121017,DCM,01,"Device Observer Physical Location During Observation ")			ANAP	CONFIG
>	HAS OBS CONTEXT	CODE	EV (113876,DCM,01,"Device Role in Procedure ")		Sel. from BCID(7445) Device Participating Roles	ALWAYS	AUTO/ CONFIG
>	HAS OBS CONTEXT	CODE	EV (113705,dcm,01,"Scope of Accumulation")	1	EV (113014,DCM,01,"Study")	ALWAYS	FIX
>>	HAS PROPERTIES	UIDREF	EV (110180,DCM,01,"Study Instance UID")	1		ALWAYS	MWL/ AUTO
>	CONTAINS	CODE	EV (113945,DCM,01,"X-Ray Detector Data Available")	0-1	EV (R-00339,SRT,"No")	ANAP	FIX
>	CONTAINS	CODE	EV (113943,DCM,01,"X-Ray Source Data Available")	0-1	EV (R-00339,SRT,"No")	ANAP	FIX
>	CONTAINS	CODE	EV (113944,DCM,01,"X-Ray Mechanical Data Available")	1	EV (R-00339,SRT,"No")	ALWAYS	FIX
>	CONTAINS	CONTAINER	EV (113702,DCM,01, "Accumulated X-Ray Dose Data")	1	"DCMR","10002","SEPARATE"	ALWAYS	FIX
>>	HAS CONCEPT MOD	CODE	EV (113764,DCM,01, "Acquisition Plane")	1	EV (113622,DCM,01,"Single Plane")	ALWAYS	FIX
>>	CONTAINS	CONTAINER	EV (122505,DCM,01, "Calibration")	0-n		ANAP	AUTO
>>>	HAS CONCEPT MOD	CODE	EV (113794,DCM,01,"Dose Measurement Device")	1	EV (A-2C090,SRT,"Dosimeter")	ALWAYS	FIX
>>>	CONTAINS	DATETIME	EV (113723,DCM,01, "Calibration Date")	1		ALWAYS	CONFIG
>>>	CONTAINS	NUM	EV (122322,DCM,01, "Calibration Factor")	1	Units = EV (1,UCUM,"no units")	ALWAYS	CONFIG

>>>	CONTAINS	NUM	EV (113763,DCM,01, "Calibration Uncertainty")	1	Units= EV (%,UCUM,"Percent")	ALWAYS	CONFIG
>>>	CONTAINS	TEXT	EV (113724,DCM,01, "Calibration Responsible Party")	1		ALWAYS	CONFIG
>>	CONTAINS	NUM	EV (113722,DCM,01, "Dose Area Product Total")	1	Units = EV (Gy.m2,UCUM,"Gy.m2")	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (113725, DCM, "Dose (RP) Total")	1	Units = EV (Gy,UCUM,"Gy")	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (113726,DCM,01,"Fluoro Dose Area Product Total")	1	Units = EV (Gy.m2,UCUM,"Gy.m2")	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (113728, DCM, "Fluoro Dose (RP) Total")	1	Units = EV (Gy,UCUM,"Gy")	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (113730,DCM,01,"Total Fluoro Time")	1	Units = EV (s,UCUM,"s")	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (113727,DCM,01, "Acquisition Dose Area Product Total")	1	Units = EV (Gy.m2,UCUM,"Gy.m2")	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (113729, DCM,01, "Acquisition Dose (RP) Total")	1	Units = EV (Gy,UCUM,"Gy")	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (113855,DCM,01,"Total Acquisition Time")	1	Units = EV (s,UCUM,"s")	ALWAYS	AUTO
>>	CONTAINS	CODE	EV (113780, DCM, "Reference Point Definition")	1	Sel. from DCID (10025) Radiation Dose Reference Points	ANAP	CONFIG
>>	CONTAINS	TEXT	EV (113780, DCM, "Reference Point Definition")	1		ANAP	CONFIG
>>	CONTAINS	CODE	EV (113876,DCM,01,"Device Role In Procedure")	0-1	EV (113859,DCM,01,"Irradiating Device")	ANAP	FIX
>>>	HAS PROPERTIES	TEXT	EV (113877,DCM,01,"Device Name")	1		ANAP	CONFIG
>>>	HAS PROPERTIES	TEXT	EV (113878,DCM,01,"Device Manufacturer")	1		ALWAYS	CONFIG
>>>	HAS PROPERTIES	TEXT	EV (113879,DCM,01,"Device Model Name")	1		ALWAYS	CONFIG
>>>	HAS PROPERTIES	TEXT	EV (113880,DCM,01,"Device Serial Number")	1		ALWAYS	CONFIG
>>>	HAS PROPERTIES	UIDREF	EV (121012,DCM,01,"Device Observer UID")	1		ALWAYS	CONFIG
>	CONTAINS	CONTAINER	EV (113706,DCM,01, "Irradiation Event X-Ray Data")	1-n	"DCMR","10003","SEPARATE"	ALWAYS	FIX
>>	HAS CONCEPT MOD	CODE	EV (113764,DCM,01, "Acquisition Plane")	1	EV (113622,DCM,01,"Single Plane")	ALWAYS	FIX
>>	CONTAINS	UIDREF	EV (113769,DCM,01, "Irradiation Event UID")	1		ALWAYS	AUTO
>>	CONTAINS	DATETIME	EV (111526,DCM,01, "Date Time Started")	1		ALWAYS	AUTO
>>	CONTAINS	CODE	EV (113721,DCM,01, "Irradiation Event Type")	1	Sel. from DCID (10002) Irradiation Event Types	ALWAYS	AUTO
>>	CONTAINS	CODE	EV (123014,DCM,01,"Target Region")	1	Sel. from DCID (4031) Common Anatomic Regions	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (122130,DCM,01, "Dose Area Product")	1	Units = EV (Gy.m1,UCUM,"Gy.m2")	ALWAYS	AUTO
>>	CONTAINS	NUM	EV (113845,DCM,01, "Exposure Index")	0-1	Units = EV (1,UCUM,"no units")	ANAP	AUTO

>>	CONTAINS	NUM	EV (113846,DCM,01, "Target Exposure Index")	0-1	Units = EV (1,UCUM,"no units")	ANAP	CONFIG
>>	CONTAINS	NUM	EV (113847,DCM,01, "Deviation Index")	0-1	Units = EV (1,UCUM,"no units")	ANAP	AUTO
>>	CONTAINS	IMAGE	EV (113795,DCM,01, "Acquired Image")	0-n		ANAP	AUTO
>>	CONTAINS	NUM	EV (113738, DCM, 01 "Dose (RP)")	1	Units = EV (Gy, UCUM, "Gy")	ALWAYS	AUTO
>>	CONTAINS	TEXT	EV (113780, DCM, 01 "Reference Point Definition")	1		ANAP	CONFIG
>>	CONTAINS	CODE	EV (113780, DCM, 01, "Reference Point Definition")	1	Sel. from DCID (10025) Radiation Dose Reference Points	ANAP	CONFIG
>>	CONTAINS	CODE	EV (113732,DCM,01, "Fluoro Mode")	0-1	Sel. from DCID(10004) Fluoro Modes	ANAP	AUTO
>>	CONTAINS	NUM	EV (113791,DCM,01, "Pulse Rate")	0-1	Units = EV ({pulse}/s,UCUM,"pulse/s")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113768,DCM,01, "Number of Pulses")	0-1	Units = EV (1,UCUM,"no units")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113742,DCM,01, "Irradiation Duration")	0-1	Units = EV (s,UCUM,"s")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113733,DCM,01,"KVP")	0-1	Units = EV (kV,UCUM,"kV")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113734,DCM,01,"X-Ray Tube Current"")	0-1	Units = EV (mA,UCUM,"mA")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113767,DCM,01," Average X-Ray Tube Current"")	0-1	Units = EV (mA,UCUM,"mA")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113824,DCM,01, "Exposure Time")	0-1	Units = EV (ms,UCUM,"ms")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113736,DCM,01, "Exposure")	0-1	Units = EV (uAs,UCUM,"uAs")	ANAP	AUTO
>>	CONTAINS	CONTAINER	EV (113771, DCM, "X-Ray Filters")	1-n		ANAP	AUTO
>>>	CONTAINS	CODE	EV (113772, DCM, "X-Ray Filter Type")	1	Sel. from DCID (10007) X-Ray Filter Types	ANAP	AUTO
>>>	CONTAINS	CODE	EV (113757, DCM, "X-Ray Filter Material")	1	Sel. from DCID (10006) X-Ray Filter Materials	ANAP	AUTO
>>>	CONTAINS	NUM	EV (113758, DCM, "X-Ray Filter Thickness Minimum")	1	Units = EV (mm, UCUM, "mm")	ANAP	AUTO
>>>	CONTAINS	NUM	EV (113773, DCM, "X-Ray Filter Thickness Maximum")	1	Units = EV (mm, UCUM, "mm")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113790, DCM, 01, "Collimated Field Area")	1	Units = EV (m2,UCUM,"m2")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113788, DCM, 01, "Collimated Field Height")	1	Units = EV (mm,UCUM,"mm")	ANAP	AUTO
>>	CONTAINS	NUM	EV (113789, DCM, 01, "Collimated Field Width")	1	Units = EV (mm,UCUM,"mm")	ANAP	AUTO
>>	CONTAINS	CODE	EV (111635,DCM,01, "X-Ray Grid")	1-n	Sel. from DCID (10017) X-Ray Grid	ANAP	AUTO
>>	CONTAINS	CODE	EV (113876,DCM,01,"Device Role In Procedure")	0-1	EV (113859,DCM,01,"Irradiating Device")	ANAP	FIX
>>>	HAS PROPERTIES	TEXT	EV (113877,DCM,01,"Device Name")	1		ANAP	CONFIG

>>>	HAS PROPERTIES	TEXT	EV (113878,DCM,01,"Device Manufacturer")	1		ALWAYS	CONFIG
>>>	HAS PROPERTIES	TEXT	EV (113879,DCM,01,"Device Model Name")	1		ALWAYS	CONFIG
>>>	HAS PROPERTIES	TEXT	EV (113880,DCM,01,"Device Serial Number")	1		ALWAYS	CONFIG
>>>	HAS PROPERTIES	UIDREF	EV (121012,DCM,01,"Device Observer UID")	1		ALWAYS	CONFIG
>	CONTAINS	CODE	EV (113854,DCM,01,"Source of Dose Information")	1-n	Sel. from DCID(10020) Source of Projection X-Ray Dose Information	ANAP	CONFIG

9.1.2 Usage of Attributes from Received IOD's

Not applicable.

9.1.3 Attribute Mapping

Not applicable.

9.1.4 Coerced/Modified Fields

None.

9.2 Data Dictionary of Private Attributes

None.

9.3 8.3 Coded Terminology and Templates

9.3.1 Context Groups

No Context Group modification or extension are used.

9.3.2 Template Specifications

No extensions to standard templates and/or private templates are used.

9.3.3 Private Code Definitions

None

9.4 Grayscale Image Consistency

Not applicable.

9.5 Standard Extended/Specialized/Private SOP Classes

None.

9.6 Private Transfer Syntaxes

None.